REPORT
ON
THE MINERAL EXPLORATION
IN
THE SAN JOSE AND ARROYO GRANDE ARRA
ORIENTAL REPUBLIC OF URUGUAY

（PHASE III）

FEBRUARY 2003

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

PREFACE

In response to the request of the Government of the Oriental Republic of Uruguay, the Japanese Government decided to conduct a Mineral Exploration Project in the San Jose and Arroyo Grande areas and entrusted the project to the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ).

JICA and MMAJ sent to Uruguay a survey team composed by 4 members from September to December 2002.

The team exchanged views with the officials concerned of the government of Uruguay and conducted a field survey including geological mapping, geochemical survey, geophysical survey and trench surveys. The surveys were completed on schedule with the valuable collaboration of DINAMIGE that is the relevant governmental agency of Uruguay.

We hope that this report will be useful for the development of the mineral resources in Uruguay and contribute to the promotion of friendly relations between Japan and Uruguay.

We wish to express our deep appreciation to the officials concerned with the Government of Uruguay for their close cooperation extended to the team.

February 2003

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Fig.1 Location map of the project areas

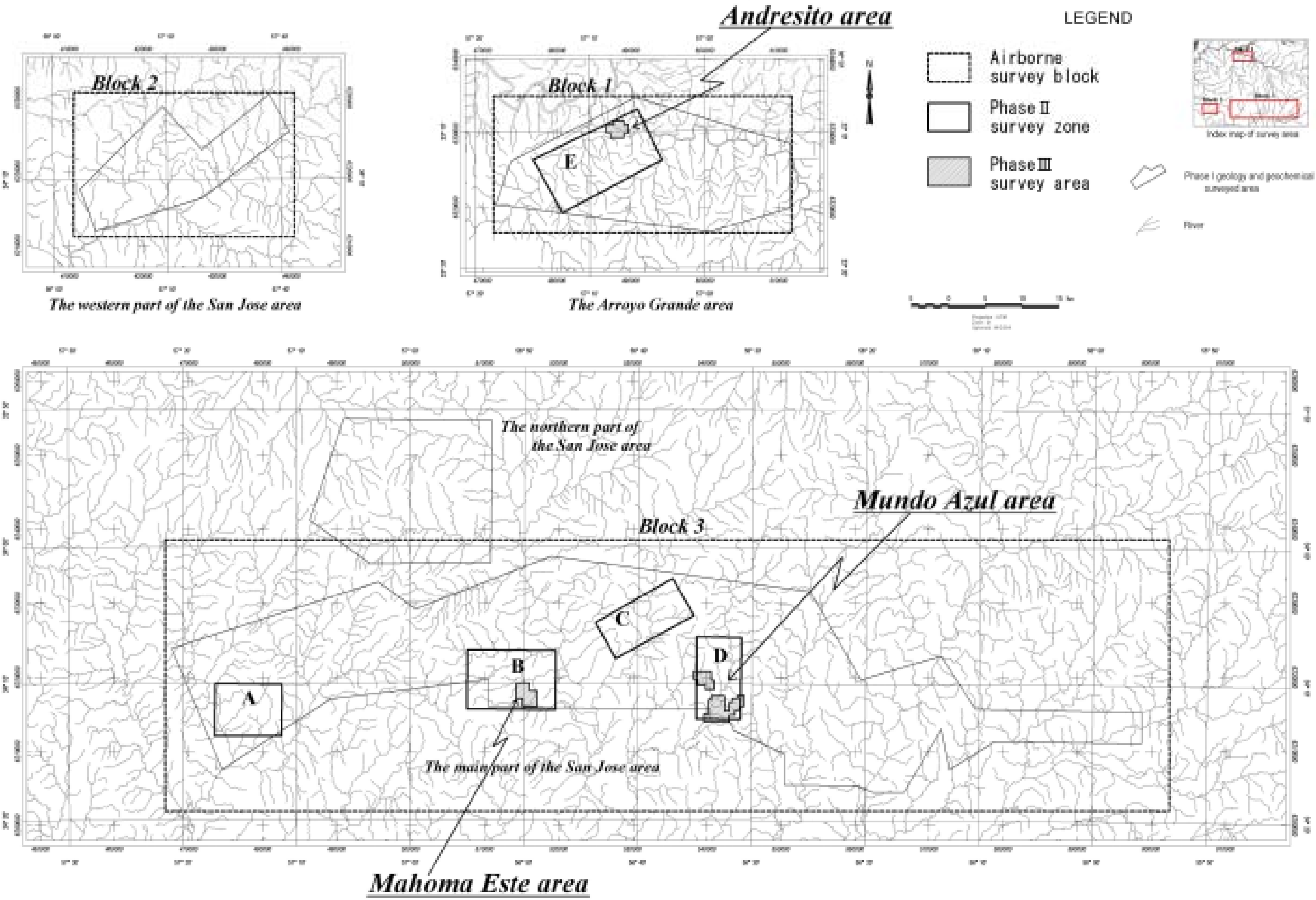

Fig.2 Location map of the Phase III

ABSTRACT

This survey is based on the Scope of Work signed between the Japanese government and the Oriental Republic of Uruguay on 24 November 2000. The purpose of this survey is to discover new ore deposits in the San Jose and Arroyo Grande area.

The survey was conceived as a three-year project that initiated in 2000. The present report describes the survey results of the third year (Phase III).

The first phase project consisted of analysis of existing data, geological interpretation of satellite image, geological mapping and geochemical prospecting. As result of Phase I survey, 13 promising zones for gold mineralization were delineated and among them, 4 zones were selected in San Jose area (zone A to zone D) and 1 zone in Arroyo Grande area (E zone). These 5 zones were recommended for Phase II survey.

The Phase II consisted of geological mapping, geochemical prospecting and airborne geophysical survey in the 5 above-mentioned zones. Phase II results recommended the following 3 zones for further investigation during Phase III.

Zone B: Mahoma area

Zone D: Mundo Azul area

Zone E: Andresito area

The Phase III consisted of geological mapping, geochemical prospecting, ground geophysical survey and trench survey in these 3 areas.

Soil geochemical prospecting conducted by using 200m x 100m grids resulted in the discovery of soil gold anomalies in the southern part of Mahoma area and in the western and central part of Andresito area.

VLF-EM and Magnetic geophysical prospecting carried out by using 100m x 10m grids resulted in the detection of several VLF and magnetic anomalies related to gold mineralization within soil gold anomalies.

Trench survey with total length of 4,520m and volume of 8,130m^3 carried out in areas showing overlapping of geochemical anomalies and geophysical anomalies detected several gold anomalies in 1m-wide samples. Trench survey results are as follows:

Mahoma East area: Trench results indicated gold values between 0.13ppm and 0.75ppm in 1m-wide intervals. Shear structures were intruded by several diabase dykes with maximum widths of 26m. Many lens and fragments of quartz veins were found within shear structure containing maximum gold values of 0.75ppm within 1m-wide samples. Detected gold mineralization was classified as low grade, small size in discontinuous veins and for this reason, further exploration surveys cannot be recommended in this area.

Andresito area: Trench results showed gold values between 0.1ppm and 2.06ppm within 1m-wide intervals. Gold mineralization was detected in quartz veins and quartz veinlets filling granodiorite and diabase dykes. Since the detected gold rich quartz veins were small size discontinuous veins, further exploration surveys cannot be recommended in this area.

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PART I GENERALITIES

CHAPTER 1　INTRODUCTION

1-1 Purpose of the survey

Oriental Republic of Uruguay (hereafter “Uruguay”) main industries are agriculture and cattle breeding. After inauguration of Mercosur, the country has made efforts to orient its economy toward developing mining and manufacturing industries. During the 1980s, mining junior companies, mostly from Canada and U.S.A. has entered Uruguay to prospect its greenstone belt areas and have discovered some gold mines as Mahoma and San Carlos in the south, and San Gregorio at the north of the country. It was followed by a request for mineral exploration survey made to the Japanese government on 10 February 2000.

The Metal Mining Agency of Japan recognized the potentiality of the proposed areas and signed the scope of work with Dirección Nacional de Minería y Geología (DINAMIGE) of Uruguay on 24 November 2000.

The purpose of this survey is to clarify the potentiality of San Jose area and Arroyo Grande areas by using various surveys methods aiming to discover new mineral deposits.

1-2 Contents and coverage area of the Phase I and Phase II

The Phase I survey areas of San Jose area and Arroyo Grande area are located in the southern part of Uruguay.　The project areas cover an area of about 12,000km^2 as indicated in Fig.I-1-1.

During the Phase I, the analysis of existing data and a geological interpretation of satellite image were carried out and based on these results, it was extracted a survey area of 2,500km^2. As shown in Tab.I-1-1 and Tab.I-1-2, the study consisted of a regional geological survey and regional geochemical survey by soil and rock sampling techniques.

As results of Phase I, 5 survey areas were recommended.

Table I-1-1　Survey contents and coverage of Phase-I

Contents of Survey	Coverage	
Existing data analysis	Surveyed area	12,000 km^2
Geologic interpretation of Satellite image data	Surveyed area	12,000 km^2
Geological mapping and geochemical Prospecting	Surveyed area Route length	2,500 km^2 630 km

Phase	Survey items	Survey contents	Survey areas: San Jose area	Survey areas: Arroyo Grande area
Phase I	Existing data analysis Satellite image interpretation	Geology and mineralization Area:12,000km² Lineaments Extraction of Greenstone belt	San Jose area	Arroyo Grande areas
	Geological mapping Soil geochemical prospecting Rock geochemical prospecting	Area:2,500km² at 1/100,000 scale Area:2,500km² 2,021 Samples Area:2,500km² 607 Samples	San Jose area Greenstone belt	Arroyo Grande area Greenstone belt
	Overall analysis	Selection of Survey areas	11 areas	2 areas
Phase II	Data interpretation	Extraction of 5 Survey areas	Zone A, Zone B, Zone C, Zone D	Zone E
	Aero geophysical prospecting Magnetic/Radiometric survey	Area:12,000km² Geological structure detection	San Jose area	Arroyo Grande area
	Geological mapping Soil geochemical prospecting	Area:400km² 1/20,000 scale Area:400km² 1,926 Samples	Zone A, Zone B, Zone C, Zone D	Zone E
	Overall analysis	Extraction of promising Areas	Zone A Anomaly, Zone C Anomaly	
Phase III	Soil geochemical prospecting Geological mapping Geophysical prospecting Electro-Magnetic(VLF-EM) Magnetic survey Trench Survey	Along 162km 1,699 Samples Area:40km 1/20,000 scale Survey points: 2,862 Survey station interval 10m Line spacing:100m Length : 4,520m 4,520 Samples	Mahoma Este area, Mundo Azul area	Andresito area
	Overall analysis	Mineralization model Selection of drilling sites	Mahoma Este area, Mundo Azul area	Andresito area

Fig. I-1-1 Survey contents and its flow from Phase I to Phase III

Table I-1-2 Laboratory tests in Phase-I

Survey	Testing method	No. samples
Geological survey Geochemical survey	Thin sections of rock	67
	Thin sections of mineral ore	38
	X-ray diffraction analysis	31
	Whole rock analysis ※1)	61
	Chemical analysis in rocks (Au, Ag, Cu, Pb, Zn, As, Sb, Hg)	607
	Chemical analysis in soils ※2)	2,021
	Fluid inclusion (homogenization temperature + salinity)	14
	Radiometric dating (K-Ar)	6

※1) Al_2O_3, CaO, Cr_2O_3, Fe_2O_3, MgO, MnO, P_2O_5, K_2O, SiO_2, Na_2O, TiO_2, LOI

※2) Al, S, As, Ba, Be, Bi, B, Cd, Ca, Co, Cu, Ga, Fe, La, Pb, Mg, Mn,Hg, Mo, Ni, P, K, Sc, Ag, Na, Sr, S, Tl, Ti, W, U, V, Zn, Au

A regional airborne geophysical survey as well as geological mapping and soil geochemical prospecting were carried out within the areas recommended in Phase I. The survey methods and survey contents that were recommended for further surveys during Phase II are listed in Tab.I-1-3 and Tab.I-1-4.

Table I-1-3 Survey contents and coverage of Phase-II

Contents of Survey	Coverage	
Geological mapping and geochemical survey	Surveyed area	400 km^2
	Route length	400 km
	Scale	1/20,000
Geophysical survey	Surveyed area	12,000 km^2
	Prospect length	27,000 km^2

Table I-1-4. Laboratory tests in Phase-II

Survey	Testing method	No. samples
Geological mapping	Thin section of rock	20
Geochemical survey	Polished section of ore	20
	X-ray diffraction analysis	20
	Chemical analysis (rock) (Au, Ag, Cu, Pb, Zn, As, Sb, Hg)	630
	Chemical analysis (soil) ※1)	1,900
	Fluid inclusion (homogenization temperature + salinity)	30
	Radiometric dating (K-Ar)	5
Geophysical survey	Remanent magnetization	8

※1) Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Co, Cu, Ga, Fe, La, Pb, Mg, Mn,Hg, Mo, Ni, P, K, Sc, Ag, Na, Sr, S, Tl, Ti, W, U, V, Zn, Au

1-3 Generalities of the Phase III survey

During Phase III, detailed geological and geochemical surveys were carried out in Mahoma East area, Mundo Azul area and Andresito area. Based on this information, VLF and Magnetic geophysical surveys as well as trench survey were carried out in Mahoma East area and Andresito area. Geochemical survey consisted of 1689 samples collected by using 200m x 100m grids; geophysical survey covered 2,662 measured points by using 100m x 10m grids. Subsequent to these surveys, keeping a distance of 100m between the trenches carried out trench survey. The contents of the surveys are shown in Tables I-1-5, I-1-6 and I-1-7.

Table I-1-5 Survey contents and the coverage of Phase-III

Contents of Survey	Coverage	
Geological mapping・Geochemical survey		
Geochemical survey	Total survey length	162km
Geological survey	Surveyed area	45 km^2
Ground trouth	Route length	40 km
Trench	Excavated amount of soil	8,130km^3
Geophysical survey	Measuring points	2,662
VLF-EM	Lines interval	100m
	Measuring interval	10 m
Magnetic survey	Measuring points	2,662
	Lines interval	100m
	Measuring interval	10 m

Table I-1-6　Number of laboratory tests in Phase-III

Survey	Testing method	No samples
Geological mapping/ Geochemical survey	Chemical analysis (trench samples)	4,520
	Thin section	20
	Polished section of ore	20
	X-ray diffraction analysis	30
	Fluid inclusion (homogenization temperature + salinity)	30
Geochemical survey	Chemical analysis (soil)	1,689
Geophysical survey	Remanent magnetization	10

※1)　Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Co, Cu, Ga, Fe, La, Pb, Mg, Mn,Hg, Mo, Ni, P, K, Sc, Ag, Na, Sr, S, Tl, Ti, W, U, V, Zn, Au

Table I-1-7　Amount of Survey during Phase-III

Area	Geochemical survey		Geological Mapping			Geophysical survey (VLF/EM・Magn.)
	Line length (m)	Chemical analysis	Ground-truth (km^2)	Trench survey Length (m)	Trench survey Amount of Excavation (m^3)	Measuring point
Mahoma East	26.4	399	20	2,245	3,220	1,105
Andresito	30,2	310	20	2,275	4,910	1,557
Mundo Azul	106.7	980	5			
Total	163.3	1,689	45	4,520	8,130	2,662

1-4 Survey Team

1-4-1 Field Inspection

Phase III: Takeshi Harada　　　(MMAJ)

1-4-2 Field survey team

The following members participated in the field survey.

Japanese side	Uruguayan side
Takeshi Katano (Team Leader)	Dr. Carlos Soares de Lima (DINAMIGE)
Junichi Yamagata (Geological and geochemical survey)	Ing. Jorge Spoturno (DINAMIGE)
Kazuyasu Tsuda (Geological and geochemical survey)	Ing. Humberto Pirelli (DINAMIGE)
David Escobar (Geophysical survey)	Ing. Richard Arrighetti (DINAMIGE)
	Ing. Javier Techera (DINAMIGE)
	Ing. Hugo Cicalese (DINAMIGE)
	Ing. Antonio Pacheco (DINAMIGE)

1-5 Survey Period

The period of field surveys was as follows:

2nd September 2002 until 16th December 2002

CHAPTER 2 GENERALITIES OF THE SURVEY AREA

2-1 Locations and Access

Uruguay is located on the eastern seashore of the South American Continent facing the Atlantic Ocean. The country borders Brazil in the north and the La Plata River and Uruguay River bordering Argentine at the south and the west. Uruguay has a surface of 176,000Km^2 and a population of about 3,160,000 (year 1996) with almost half of the population living in the capital, Montevideo (Fig.1 and Fig.2).

The San Jose area is located within San Jose de Mayo district at approximately 90km northwest of the capital Montevideo. The Arroyo Grande area is located about 140km northwest of the capital Montevideo and it takes around two and a half hours by car from Montevideo City.

2-2 Topography and Drainage system

The highest altitude in Uruguay is 514m above sea level. The whole country presents in general a flat to gently topography, particularly the southern part of the country that includes the project area. In the eastern part of San Jose area, the Santa Lucia River flows southward, the San Jose River flows in the central part and Rosario and San Juan Rivers flow in the western part of the area. The Negro River flows westward in the Arroyo Grande Area.

2-3 Climates and Vegetation

According to world climate division, Uruguay belongs to temperate rainy climate with mild annual average temperature of about 16℃. In winter season, from June to September, the average temperature frequently reaches temperatures below 10℃. During the summer season from December to March, the average temperature is around 23℃. The average annual precipitation in Montevideo is around 1000mm, which is considered low for a temperate rainy climate. The best period for field survey is between September and December due to the low rainfall rate and mild temperatures.

The vegetation in the survey area consists of natural and artificial pasture, with low trees spots along the riverside.

CHAPTER 3 RESULTS FROM PHASE I SURVEY

3-1 Outline of the survey

Geological mapping, geochemical survey, analysis of existing data and geologic interpretation of satellite image were carried out during Phase I. A total of 13 zones with quartz veins were extracted from geological mapping within the Phase I survey area. Other anomalous zones with gold above 5ppb were selected by geochemical prospecting. Airborne geophysical survey, geological mapping and soil geochemical prospecting were recommended to be carried out in five potential survey areas.

3-2 Survey results

The geological formation of this area consists of basement complex, volcano sedimentary sequence, ancient granite intrusive rocks and younger granite intrusive rocks. The volcano sedimentary sequence is represented by San Jose formation, Paso Severino formation and Arroyo Grande formation. 2,021 soil samples were collected during soil geochemical prospecting. As result of field survey, 13 quartz veins zones were delineated and 5 zones were selected for further exploration survey during Phase II.

CHAPTER 4 RESULTS FROM PHASE II SURVEY

4-1 Outline of the survey

Geological mapping, soil geochemical prospecting and airborne survey were performed during Phase II.

A total of 1,926 soil samples were collected using a semi-grid distribution at the depth of B-horizon. The spacing of the samples was designed so that 4 to 5 soil samples can be taken every square kilometer. A total of 531 chip samples from quartz vein showing different characteristics were collected during Phase II. Airborne survey was carried out in an area of 12,000Km2 that includes San Jose area and Arroyo Grande area.

4-2 Survey results

Geological mapping showed 17 quartz veins zones within the 5 surveyed zones. Survey results confirmed that most of these quartz veins fill geological structures such as shear zones, boundaries between geological units and faults within intrusive rocks or within greenstone rocks.

Phase II indicated 6 soil gold anomalies and 17 zones containing large outcrops of quartz veins. Zones with large amounts of quartz veins fragments are preferentially located at the proximity of shear zones and faults that cut volcano sedimentary sequence or granites rocks. Part of the soil gold anomalies overlaps the quartz veins zones, but the majority of the soil anomalies were detected in sites where outcrop of rock or quartz veins are not present.

Information on geological structures provided by airborne geophysical survey indicates that the soil gold anomalies are frequently present at the sites where linear magnetic anomalies with ENE-WSW trend are present.

As a result of Phase II survey it was recommended for Phase III a previous soil geochemical prospecting and geological mapping followed by geophysical survey and trench survey.

CHAPTER 5 RESULTS FROM PHASE III SURVEY

5-1 Mahoma East area

(1) Geological mapping

San Jose greenstone rock (pCCsjo) was observed in the northeastern part and in southern part of the survey area while granite (pCC) was observed in the southwestern and southern part. Aplitic dykes, granitic dykes and dolerite dykes were observed within granite (Fig.II-5-1).

San Jose unit is composed essentially by biotite schist and greenschist, locally filled by lenses of quartz veins and silicified rocks. General trend is N70W plunging 30 degrees to south; only at the proximity of the granitic intrusion the schistosity has the direction of the intrusive body.

(2) Soil geochemical prospecting

A total of 399 soil samples were collected from Mahoma East area, as shown in (Fig.II-5-3). Gold anomalies were confirmed within granite rocks that outcrop at the southern part of the survey area. Gold anomalies are present at the southeastern part of the granite at the proximity of the border with San Jose units. Gold threshold values were taken at 12ppb and the maximum gold value was 96ppb. A possible relationship between gold anomalies and magnetic structure was suspected because the gold anomalies approximately overlap the linear magnetic anomaly detected during airborne survey of Phase II.

(3) Geophysical survey

Fifteen survey lines of ground magnetic and VLF survey, as shown in Fig.II-5-6), were oriented along NS direction and spaced 100m between them. Survey stations were each 10m along the lines. A total of 10.9 kilometers of line were surveyed both with Magnetic and VLF surveys.

The VLF data were collected at the same stations as the magnetic data. Both RTP and Fraser map indicate the possibility of mineralization in places of low-high conductivity and low-high magnetic intensity that may be associated to the emplacement of a dyke structure probably associated with a controlled deposition of gold mineralization. The causes of minor features on the north and south of the central lines of the VLF Fraser results are unclear but it is unlikely that they are related to faults.

The results of the magnetic survey (Fig.II-5-7) indicated that a dolerite dyke underlies the trend of magnetic high, while the zones of magnetic lows are inferred to be associated with green-schist zone. Areas of intermediate magnetic intensity are extensions of the high magnetic and interpreted to be caused by granite.

(4) Trench survey

Shear zones of varied width, from decimeter to several meters wide and trending ENE-WSW were identified by the trench survey. Diabase dykes with maximum width of 26m and containing quartz veins lenses were intruded in the shear structures. Gold anomalies were confirmed in quartz veins within sheared granite and diabase dyke. The maximum gold grade detected in 1m-wide samples taken from the trenches was 745ppb.

Maximum width of diabase dyke was 26m and it was found on trench 516100 that presented clay and silicification alterations at both borders. Trench 516200 showed the boundary between granite (pCC) and San Jose formation (PCCsjo) and Trench 516300 showed granites dykes filling San Jose formation.

1m-wide channel samples were taken from trench bottom for chemical analysis and the following results were confirmed.

Trench 515700: Au 0.15ppm(w: 2m), Au 0.2ppm (w:1m), Au 0.21ppm(w:1m), Au 0.20ppm (w:1m), Au 0.23ppm (w:1m), Au 0.21ppm (w:1m), Au 0.13ppm(w:3m), Au 0.16ppm (w:1m) and Au 0.27ppm (w:1m) were confirmed in 1m-wide intervals of granite and diabase showing quartz veins lenses or quartz veins fragments.

Trench 515800: Au 0.48ppm (w:1m), Au 0.31ppm (w:1m), Au 0.54ppm (w:1m), Au 0.25ppm (w:2m), Au 0.31ppm (w:1m) were confirmed in 1m-wide intervals of granite and diabase showing quartz veins lenses or quartz veins fragments.

Trench 515900: Au 0.18ppm(w:1m), Au 0.17ppm (w:1m), Au 0.31ppm(w:5m), Au 0.14ppm (w:1m), Au 0.24ppm(w:3m), Au 0.14ppm (w:1m), Au 0.14ppm (w:1m), Au 0.14ppm (w:2m) were confirmed in 1m-wide intervals of granite showing quartz veins lenses or quartz veins fragments.

Trench 516000: Au 0.19ppm (w:1m), Au 0.18ppm (w:1m) were confirmed in samples of granite with quartz veins lenses or in diabase dyke with quartz veins fragments.**Trench 516100:** Au 0.34ppm (w:1m), Au 0.26ppm (w:2m) were confirmed in 1m-wide intervals of granite showing quartz veins lenses or quartz veins fragments.

5-2 Andresito area

(1) Geological mapping

Arroyo Grande greenstone rock (pCCag) is widely distributed in the survey area, granite (pCC) was observed at southern part while ancient granitic rock (pCCG) was observed at northwestern part. Migmatite and strong metamorphism was observed within ancient granite. Dolerite dyke was observed within granodiorite intrusion (Fig.II-6-1). Aplite, granodiorite and dolerite dykes were observed within greenstone rock.

(2) Soil geochemical prospecting

A total of 310 soil samples were collected from Andresito area as shown in Fig.II-6-2.

Soil gold anomalies were detected in the western part and central part of Andresito area. Gold anomaly of western part can be divided in two: one at north and other at south. The south anomaly was detected within granodiorite whereas the north anomaly was located in the boundary between gabbro and Arroyo Grande formation. In the north anomaly, the maximum gold value in soil was 60ppb and in the south anomaly it was 33ppb. The gold anomaly of the central part was located within outcrops of metabasalt and metatuff and it showed maximum gold value of 40ppb.

(3) Geophysical survey

Geophysical survey was carried out in Andresito East area and Andresito West area.

In Andresito West area, 9 survey lines of ground magnetic and VLF-EM survey were set along the NS direction. The lines were prepared by using the same method as in Mahoma East survey area. A total of 8.35 km of lines for each survey method was surveyed (Fig.II-6-4).

A relatively strong magnetic trending is seen along NE direction, and it may be probably due to high magnetic volcano-sedimentary rocks. To the north of this trending, it was detected a magnetic contrast from intermediate to low magnetic and inferred to be caused by shear fault zones (Fig.II-6-5). The low magnetic zone detected to the south of the above mentioned trending might be due to the response of gabbro/granodiorite structure.

In Andresito East area, a system of trends of weak positive-negative VLF anomalies was detected along SE direction from the NW part of the area (Fig.II-6-6). According to the magnetic results, a fault system is seen distributed from the north east part of the area. They are also weakly detected by the VLF survey (Fig.II-6-7).

(4) Trench survey

More frequently observed rocks are ancient granite (pCCG) at north and northeast, Arroyo Grande formation (pCCag) at central part and granodiorite (pCC) at southwestern part. The Arroyo Grande formation is mainly represented by metabasalt intercalated in schist. Ancient granite (pCCG) was confirmed at the northern extension of the Arroyo Grande formation separated by a wide shear zone. Granodiorite is surrounded by gabbro and its boundaries with Arroyo Grande formation is made by faults. Several aplitic dykes, granodiorite dykes and diabase dykes were seen within Arroyo Grande formation. Stereo net interpretation of the survey area, showed strong NW-SE structure and it was followed by NNE-SSW structures. Trench survey confirmed schistosity striking E-W and shear zones and faults along ENE-WSW directions. Quartz veins with visible gold fill granodiorite (pCC) present E-W to ENE-WSW strike and north dip.

1m-wide channel samples taken from trenches showed gold anomalies in granite and diabase filled by quartz veins and quartz veinlets.

Trench 486900: 15m～16m(w:1m) Au0.95ppm and 94m～95m(w:1m) Au1.09ppm.

Trench 487000: 22m～26m(w:4m) Au0.29ppm, 68m～69m(w:1m) Au0.31ppm, 118m～119m(w:1m) Au0.22ppm, 134m～135m(w:1m) Au2.06ppm, 136m～149m(w:13m) Au0.31ppm.

Trench 487100: 158m～159m (w:1m) Au0.08ppm, 196m～197m(w:1m) Au0.08ppm, 253m～254m （w:1m）Au0.16ppm, 277m～278m(w:1m) Au0.57ppm, 319m～320m(w:1m) Au0.09ppm, 424m～429m (w:5m) Au0.11ppm, 466m～467m(w:1m) Au0.12ppm.

Trench 487200: 44m～46m(w:2m) Au0.20ppm, 98m～99m(w:1m) Au0.35ppm, 124m～125m(w:1m)

Au0.09ppm, 145m～148m(w:3m) Au0.19ppm, 369m～370m(w:1m) Au0.11ppm, 388m～392m(w:4m) Au0.15ppm.

Trench 488500: 55m～56m(w:1m) Au0.39ppm.

Gold mineralization in dolerite or border of dolerite is associated with gold rich quartz veinlets and quartz veins fragments filling dolerite dyke. They are probably related to the last stage of granodiorite intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets. Observation of Polished section in 16 samples of quartz veins detected gold particles in 10 samples. Milky quartz vein of the trench 487000 (142m) and trench 486900 (93m) presented accessory minerals as pyrite and goethite. Gold mineralization detected in quartz veins of the southern trenches shows spots with slightly high gold grade, however, it lacks not only in homogeneity of gold content but also in veins thickness and extension.

5-3 Mundo Azul area

(1) Geological mapping

The geology of the Mundo Azul area (Fig.II-7-1) consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granitic unit (pCCG). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence that are widely distributed in the Mundo Azul area. Meta-volcanic rocks are present in the central part whereas meta-sedimentary rocks are present at the northern part and at the eastern edge of the areas.

(2) Soil geochemical prospecting

Statistical data treatment performed for 980 soil samples collected from Mundo Azul areas showed that the analyzed 31 elements (Ag, Sb, Bi, Be, Mo, Sn and W) indicated values of less than the detection limit for most of the samples (Fig.II-7-4). Correlation coefficients were calculated in order to clarify the relation among elements, however, the analyzed elements did not indicated any correlation with gold.

A threshold value of Au was calculated to be 8ppb, so that values above 8ppb were considered as gold anomalies. No concentration of soil anomalies was detected in Mundo Azul north area and very limited gold anomalies with maximum gold values of 20ppb were detected in the south area.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6-1 Conclusions

Geological mapping, soil geochemical prospecting, geophysical survey and trench survey were carried out during Phase III survey in Mahoma East area, Andresito area and Arroyo Grande area. The extracted conclusions are as follows:

(1) Mahoma East area

Statistical treatment of the collected 399 soil samples showed gold threshold value of 12ppb and maximum gold value of 96ppb in soil samples. Soil geochemical survey confirmed wide gold anomalies within granite rocks (pCC) that outcrop in the southern part of the survey area. Gold anomalies are present in the southeastern part of the granite at the proximity of the border with San Jose units. The detected gold anomalies approximately overlap the linear magnetic anomaly detected during airborne geophysical survey of Phase II. VLF-EM and magnetic geophysical prospecting carried out within soil geochemical anomalies confirmed linear magnetic and VLF anomalies overlapping the magnetic structure detected by airborne survey. Trench survey confirmed that the high magnetic anomalies and low VLF-EM anomalies were associated with diabase dyke. San Jose greenstone rock (pCCsjo) is distributed in the northeastern part and in the southern part of the survey area while granite (pCC) outcrops in the southwestern part and southern part of the same area. Aplitic dykes, pegmatite veins and dolerite dykes were observed within granite (pCC). Several shear zones with ENE-WSW direction were also identified by the trench survey. Diabase dykes with maximum width of 26m filled by quartz veins lenses and fragments were found within shear structures and 1m-wide channel sample confirmed maximum gold values of 745ppb. Other channel intervals confirmed the following results in diabase and granite filling quartz veins and quartz veinlets: trench 515600 with gold values between 0.13ppm and 0.75ppm, trench 515700 with gold between 0.13ppm and 0.27ppm, trench 515800 with gold between 0.25ppm and 0.54ppm, trench 515900 with gold between 0.14ppm and 0.31ppm.

(2) Andresito area

Chemical analysis of the collected 310 soil samples indicated threshold gold value of 12 ppb. Soil gold anomalies were detected at the western part and central part of the surveyed area. Gold anomaly of western part can be divided in two anomalies: one in the north and the other one in the south of the area. The south anomaly was confirmed in granodiorite, while the north anomaly was located in the border between gabbro and Arroyo Grande formation. Gold anomaly of the central part was present within outcrops of metabasalt and metatuff. Arroyo Grande greenstone rock (pCCag) that is widely distributed in the survey area is intruded by Granodiorite (pCC) at southern part and ancient granitic rock (pCCG) at northwestern part. Granodiorite intrusion shows lower silica content at its northern border and in these places it presents a gabbro texture. The maximum gold value in soil in the north anomaly was 60ppb and in the south was 33ppb. Low dip quartz veins fill granodiorite with approximate E-W strike and showing a parallel distribution. Visible gold is frequently seen in the veins fractures.

Simultaneous to the ground magnetic survey, VLF-EM survey was conducted in Andresito West and East areas. VLF data were collected at the same profiles and stations as the magnetic data. According to the magnetic results, a fault system is seen distributed from the north east part of the area. They are also weakly detected by the VLF survey. A relatively strong magnetic trend is seen along NE direction, and it might probably be due to high magnetic volcano-sedimentary rocks. To the north of this trending, it was detected a magnetic contrast from intermediate to low magnetic and inferred to be caused by shear fault zones. The low magnetic zone detected to the south of the above mentioned trending might be due to the response of gabbro/granodiorite structure.

1m-wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows: Trench 486900: Au0.95ppm～Au1.09ppm, Trench 487000: Au0.22ppm～Au2.06ppm, Trench 487100: Au0.08ppm～Au0.57ppm, Trench 487200: Au0.09ppm～Au0.35ppm, Trench 488500: Au0.39ppm in quartz veins. Gold mineralization are probably associated to the last stage of granodiorite intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets. Gold mineralization detected in quartz veins of southern trenches shows spots with high gold grade, but it lacks in homogeneity of gold content, in veins thickness and extension. The above characteristics are indicative of a low potentiality to find an economic gold deposit within Andresito area.

(3)Mundo Azul area

Statistical treatment carried out on a total of 980 soil samples taken from Mundo Azul areas, indicated that the correlation coefficients showed no correlation among the analyzed elements and gold. Though the threshold values of Au were calculated to be 8ppb, no concentration of soil anomalies was detected in Mundo Azul north area and very restricted gold anomalies with maximum gold value of 20ppb were detected in the south area.

The geology of the Mundo Azul area consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granite unit (pCCG). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence widely distributed in the Mundo Azul area. Both, Mundo Azul north and south areas show intrusion of ancient granite (pCCG), which is intruded by dykes of diabase (dd). Several faults and shear zones control the boundary between San Jose greenstone unit and ancient granite. Diabase dykes outcrop along ENE-WSW direction that is concordant with the high magnetic anomalies detected during Phase II airborne survey.

6-2 Recommendations

Recommendations for further surveys in Mahoma East area, Andresito area and Mundo Azul area are as follows:

(1) Mahoma East area

Trench survey detected wide shear zone intruded by diabase dykes with maximum width of 26m and lenses of quartz veins are filling these shear structures. Gold values between 0.13ppm and 0.75ppm in 1m-width channel were confirmed in granite and diabase. Gold mineralization detected in Mahoma East area presents low grade and it also lacks in homogeneity of gold content and extension. Due to this reason, no further exploration work can be recommended in this area.

(2) Andresito area

1m-wide channel samples taken from the southern trenches of Andresito area showed maximum gold values of 2.06ppm with gold values between 0.1 and 2.0 ppm in quartz veins. Since these results indicate a lack not only in homogeneity of gold content but also in veins thickness and extension, no further exploration survey can be recommended in this area.

(3) Mundo Azul area

Soil geochemical prospecting results indicated low threshold gold value of 8 ppb and only few soil gold anomalies detected with maximum of Au20ppb. Due to this reason, geophysical prospecting and trench surveys were not recommended during Phase II and no further survey is recommended for this area.

PART II SURVEY RESULTS

CHAPTER 1　OBJECTIVE OF THE SURVEY

Geological mapping, geophysical prospecting, soil geochemical prospecting and trench survey were carried out during Phase III survey in Mahoma East area, Andresito area and Arroyo Grande area, as shown in Fig.1 and Fig.2. The main objective of the survey was to clarify the mining potentiality of the survey area by understanding its geological structure related to the gold mineralization.

CHAPTER 2　GENERALITIES OF THE SURVEY AREA

2-1 Locations and Access

The project area is located in the northern part of Montevideo and it consists of three areas: Mahoma East area, Andresito area and Arroyo Grande area.　Mahoma East area and Mundo Azul area are located within San Jose district that is located 90Km northwest of Montevideo and Arroyo Grande area is located 140Km to northwest of Montevideo within district of Flores. Mahoma East area is located about 30 Km to north of San Jose de Mayo city and Mundo Azul area is located about 40 Km to northeast from the same city. Andresito area is located about 90 Km to north from San Jose de Mayo city.

2-2 General geology

The geology of this area consists mainly of basement complex (pCCcb, pCCanf), volcano sedimentary units (pCCsjo, pCCsj, pCCps and pCCag), ancient granite (pCCG), younger granite (pCC), Cretaceous, Neogene and Quaternary sedimentary sequence those overlays the above units (Fig.II-2-2). The stratigraphic column of the area is shown in the Fig.II-2-1, Fig.II-2-2 and Fig.II-2-3.

2-2-1 Basement complexes

The basement complex is distributed in the western edge and at the eastern part of the San Jose belt. It is also present in the northwestern part of the San Jose belt and along the southern edge of the Arroyo Grande belt. Faults separate in general the basement complex units and younger units.

The basement complex is mainly composed of gneiss, schists, silicified rocks, amphibolite and granites, and locally by migmatite and hornfels.　Granites shows weak foliation related to metamorphism.

2-2-2 Volcano sedimentary sequences

(1) Greenstone units

As recommended by Mason, 1990 and other authors, the denomination greenstone was adopted in this report to the rocks composing the San Jose belt and Arroyo Grande belt.

The greenstone rocks of the San Jose formation (pCCsjo) was subjected to medium grade metamorphism while the Paso Severino (pCCps), the Cerro de San Juan (pCCsj) and the Arroyo Grande (pCCag) formations were subjected to a weak metamorphism.

Preciozzi et al. (1991) proposed the name San Jose belt to designate a southward increase in the metamorphic grade. Also, this denomination was proposed to put together several metamorphic units as Paso Severino formation, San Juan formation and Cerros de San Juan formation.　Mica schist and quartz schist, metavolcanic rocks and metasedimentary rocks compose the common lithofacies of these four formations.

The San Jose formation mainly consists of mica schist, quartz schist, gneiss, meta-rhyolite, meta-basalt, quartzite, meta-sandstone, green rock, slate, phyllite and amphibolite. The quartz schist shows porphyroclastic texture, where quartz and plagioclase are imbedded as relict mineral in the matrix, which has a developed schistosity and consists of plagioclase, muscovite and quartz. The amphibolite is composed of quartz, plagioclase, epidote, amphibolite and actinolite. Green rock is a massive rock consisted of fine-grained epidote, titanite, chlorite, quartz, albite, carbonate minerals and magnetite. The mineral assemblage is an indication of low-grade metamorphic rocks.

The Arroyo Grande formation consists of green-schist, mica-schist, quartz-schist, gneiss, meta-basalt, meta-gabbro, meta-sandstone, slate, phyllite and amphibolite. The meta-sandstone consists of metamorphic minerals such as quartz, plagioclase, potassium feldspar and muscovite.

Locally, it shows porphyroclastic texture, where quartz and potassium feldspar are imbedded as relict mineral in the matrix of fine-grained metamorphic minerals. A weak foliation is recognized.

(2) Upper units

Cretaceous rocks overlays the Arroyo Grande belt and it consists mainly of siliceous rock, agate and fine-grained sandstone.

Neogene rocks are present in the eastern part of the San Jose belt and at the central portion of the western part of the San Jose belt. It consists mainly of mudstone, fine-grained sandstone, conglomerate and breccias.

Quaternary unit consists mainly of recently deposited sand, gravel and clay.

2-2-3 Intrusive rocks

Ancient granite (pCCG), younger granite (pCC), dolerite (dd) and gabbro (gb) are present in the survey area.

Ancient granite outcrops in many areas, as at the west and Middle Eastern part of the San Jose area, at western part of the San Jose area and the central and northern parts of the Arroyo Grande area. Ancient granite consists mainly of middle to coarse-grained equigranular or porphyritic biotite granite, muscovite granite, granodiorite, diorite and quartz diorite, and they were subjected to metamorphism. Locally, it is observed strong shearing, foliation and mylonitization at the proximity of a fault zone along E-W and NW-SE directions in the Middle Western part of the San Jose area. Microscopic examination of biotite granite showed blastoporphyritic texture with quartz, potassic feldspar and plagioclase as well as biotite phenocryst. Muscovite granite shows phenocryst of quartz, potassium feldspar, plagioclase and muscovite. Granodiorite presented quartz, plagioclase and amphibolite’s phenocryst.

Younger granitic rocks outcrop as stock in the whole survey area of the San Jose area and Arroyo Grande area. They are composed of coarse-grained equigranular or porphyritic biotite granite, muscovite granite, two mica granite, hornblende granite, leucogranite, granodiorite, diorite and tonalite. By microscopic examination, the younger granite showed phenocrysts of quartz, potassic feldspar and plagioclase and mafic minerals as biotite, muscovite, hornblende and minor constituents of apatite, zircon, titanite and magnetite.

Dolerite fills NE-SW fracturing structure in the central part and western part of the San Jose area and it intrudes the younger granite (pCC). On the microscopic examination, dolerite presented minerals as hornblende, plagioclase, epidote and magnetite.

Datation made on biotite granite that hosts the Mahoma mine, showed an age of 1960±140Ma by K-Ar method. The biotite granite has been classified in the bibliography as ancient granite intrusive (pCCG). Existing data showed an age of 2200Ma for the same biotite granite. Geological map of Uruguay on a scale of 1:500,000 classify the amphibolite with age of 2000±280Ma as part of the basement Complex.

Datation was also estimated for younger granite (pCC). In the San Jose area, the datation results were as follows. Two mica granite showed an age of 1690±120Ma, muscovite granite an age of 1240±10Ma and a biotite granite an age of 1750±120Ma. In Arroyo Grande area, leucogranite indicated an age of 1980±130Ma. Existing information classifies the age of younger granite (pCC) between 1800 and 2000Ma correlating these granites with the igneous activity of the Transamazonian orogenesis.

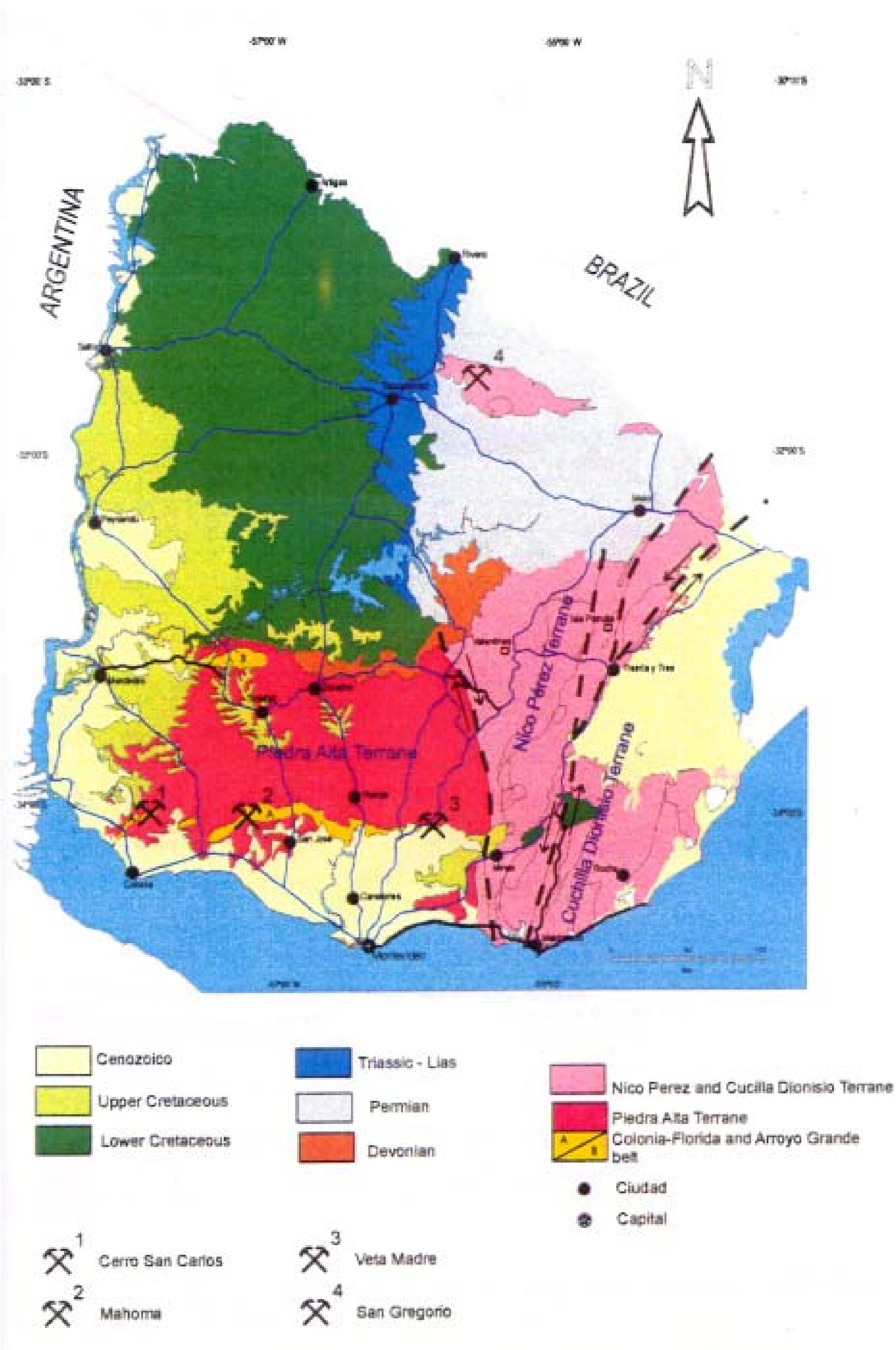


Fig.Ⅱ-2-1　Geological map of Uruguay

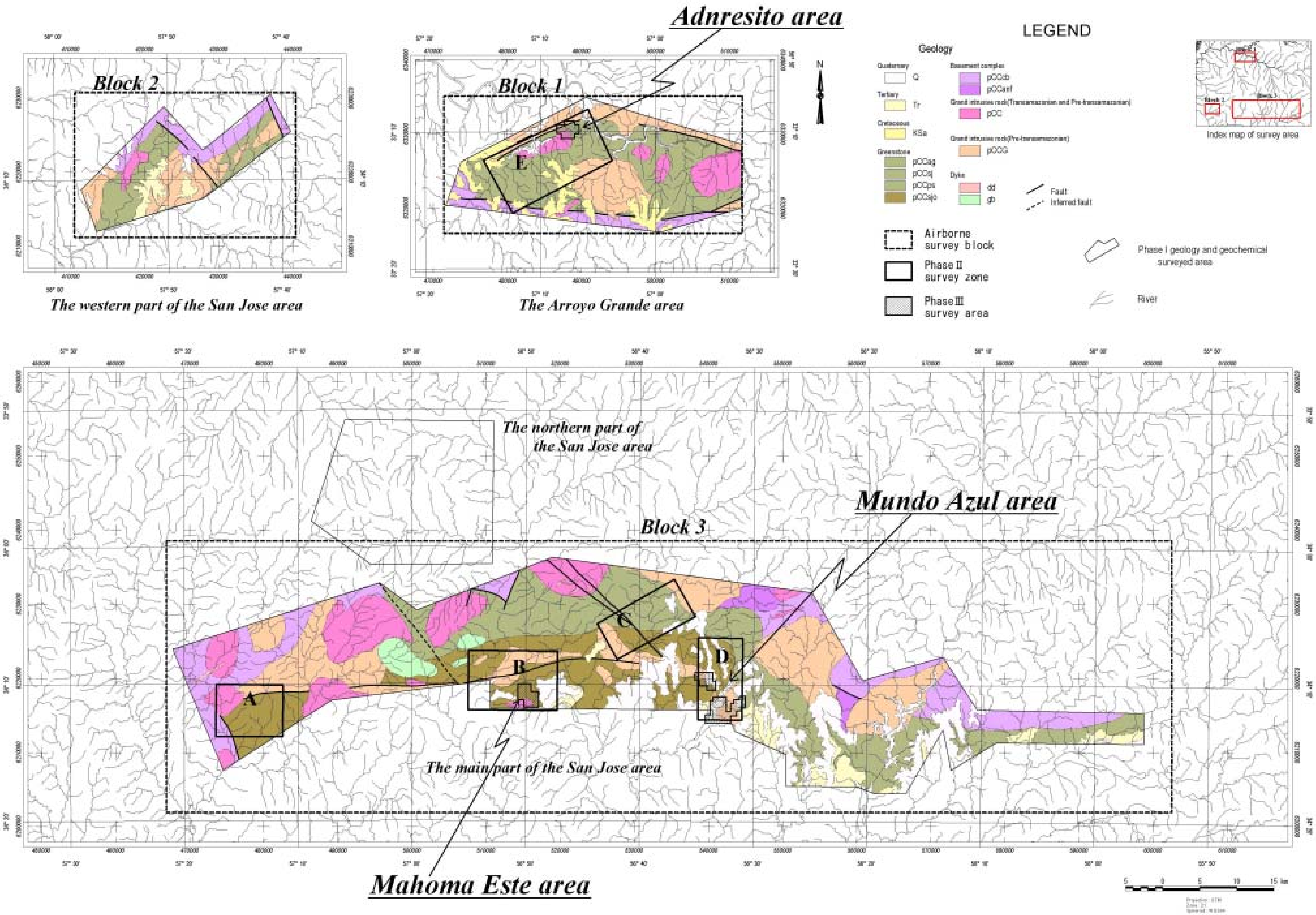


Fig. II-2-2 Geological map of greenstone belts surrounding Phase III survey area

Age (Ma)	Units	Events	Domain
1,400-1,800	Doleritic dykes	Distensive enviroments	
1,845 1,900	Pintos granite	*CRATONIZATION*	
1,900-1,970	Aplites and granitic dykes Leucogranite dykes		TRANSAMAZONIAN OROGENESIS
2,000-2,070	Granite-gneissic complex Granitic dyke Isla Mala Gabbroic Complex Mahoma-Guaycuru		
2,070-2,100		Metamorphism, migmatization, granitization and folding	
2,100	Leucogranite	3^{rd} deformation phase	
2,180 2,225	Southern granite A. Virgen leucogranite	Syncolisional Paso Lugo fault Late orogenic	PRE TRANSAMAZONIAN
2,270-2,290	A. Grande granodiorite Hornblendites Isla Mala leucogranite San Jose Granodiorite	Distensive, 2^{nd} deformation phase *MYLONITIZATION*	
2,291-2,386	Marincho main granodiorite		
2,450	Isla Mala granodiorite		
2,500-2,544	*San Jose metamorphic belt* Alkaline granite	Metamorphism+1^{st} deformation phase	
	Arrojo Grande metamorphic belt Complejo Basal	Metamorphism+1^{st} deformation phase	ARCHEAN

Stratigraphy in accordance with PRECIOZZI et al.(1999). Modified.

Fig. I-3-3 Schematic stratigraphic column of survey area

CHAPTER 3　SURVEY METHODS

3-1 Survey methods

Geological mapping, geochemical prospecting, geophysical survey and trench survey were carried out. Semi-detailed Geochemical prospecting, VLF-EM and magnetic geophysical survey and trench survey with sampling at 1m spacing were performed. The laboratory tests carried out were thin section, polished section, X-ray, fluid inclusion, chemical analysis and measurement of remanent magnetism.

3-2 Survey flow

The survey flow is shown in the Fig.II-3-1.

3-3 Survey proceeding

3-3-1 Geological mapping

Geological mapping were performed with 1:20,000 scale and the locations were confirmed by GPS, topographic map and aerial photo.

3-3-2 Soil geochemical prospecting

This prospecting was performed with collection of soil samples in 100m by 200m grids. The samples weighting more than 1 Kg were taken at B-horizon by using shovel. The samples were prepared in the Dinamige laboratory, by drying at 56 degrees Celsius and sieving to under 80 meshes.

The samples were sent to the Lakefield laboratory in Brazil and 150grams of it were stored at Dinamige.　Chemical analysis was carried out for the 31 elements as follows: Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, K, Ag, Na, Sr, Zr, Sn, Ti, W, Li, V, Zn, Cr and Au. The methodology employed for gold analysis was fire assay-AA and for the others elements were employed acqua regia/ICP. The chemical analysis was carried out at the Lakefield Geosol Laboratory in Brazil.　The result of the analysis is shown in Appendix 6.

The results from geochemical samples were statistically analyzed. Based on statistical processing, computerized distribution maps were drawn for every elements. The correlation matrices among the elements were also calculated and the Exploratory Data Analysis (EDA) method was applied to define the threshold values (anomalous values) for each element. Factor analysis studies were also utilized for the processing of geochemical data, but no correlation between gold and others analyzed elements were found.

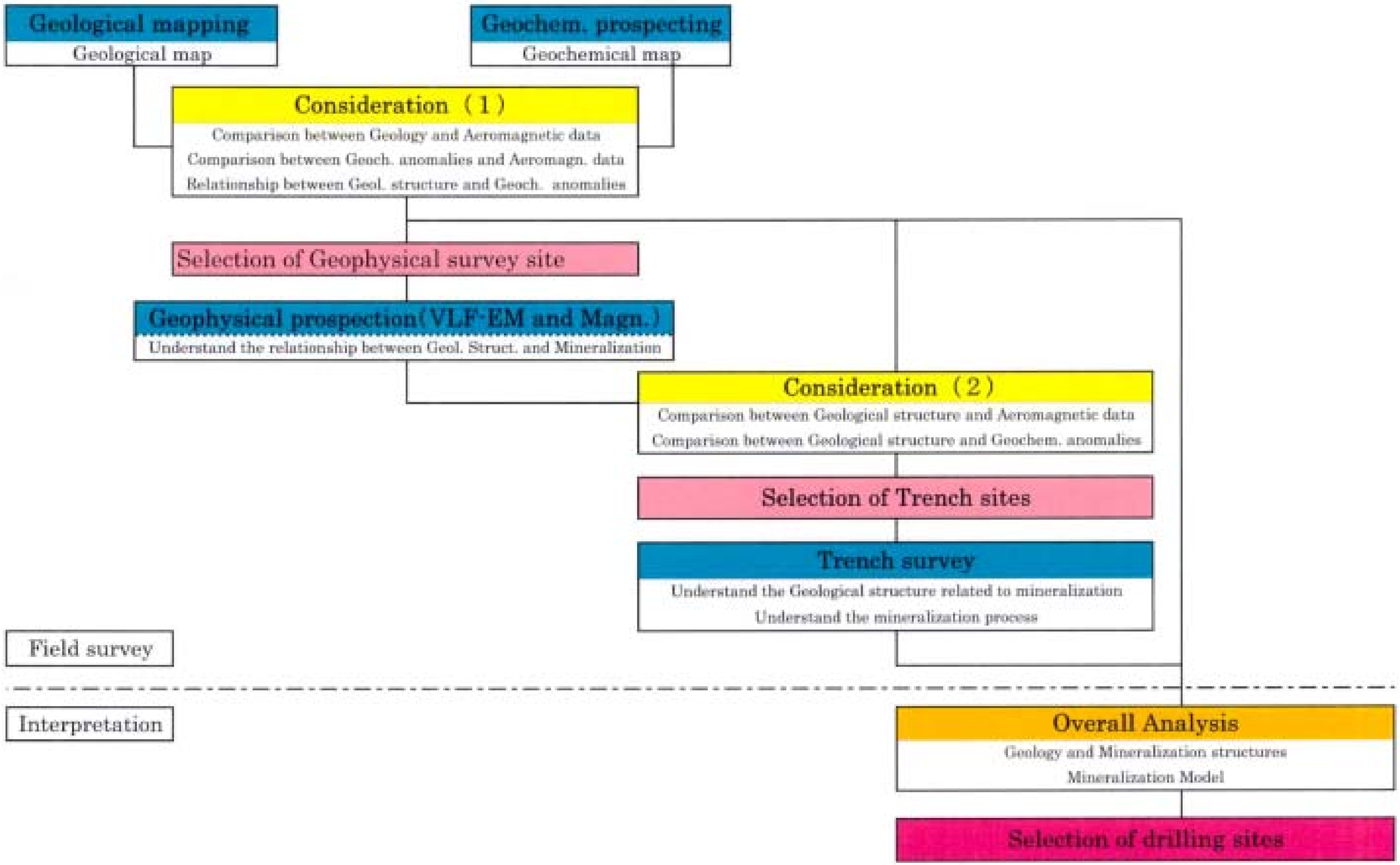


Fig. II-3-1 Field survey and interpretation flow during Phase III

3-3-3 Geophysical surveys

(1) Survey content

VLF-EM and Magnetic survey (Tab.II-3-1) were carried out with 10m interval along lines spaced 100m. A total of 2,662 points were measured as follows.

Table II-3-1 Geophysical work coverage

Survey area	Lines	Length (km)	Points	Area (km^2)
Mahoma East	15	10.9	1,105	1.00
Andresito East area	9	8.35	844	0.74
Andresito West area	13	6.2	713	0.72
Total	37	25.45	2,662	2.46

The survey was carried out in the period between October 10 and November 15, 2002. The purpose of this survey was to assist in the clarification of the overall structural and lithological mapping of the Mahoma East area as well as Andresito East and West areas by using ground magnetic and VLF surveys data. The Project area covered by this survey consisted of 3 areas: Mahoma East, Andresito West and Andresito East areas.

(2) Measurements method

1) VLF-EM

The VLF (Very Low Frequency) surveying method is a frequency domain EM technique that makes use of low-frequency radio transmissions as a source. In general this method uses powerful radio transmitters used for military communications and operated at frequencies for about 15 to 25kHz. The survey lines were oriented N-S and the survey grid was the same as that grid used for the magnetic survey.

2) Magnetic

The magnetic prospecting method was applied in three areas in order to map the distribution of magnetic minerals in the rocks and to characterize geological features, such as alteration zones, faults/structures, and intrusions. These features may represent possible environments to which gold deposits are often associated. A grid was laid out on the basis of the area selected by the geological team. 15 NW lines were located at 100m intervals.

(3) Instrumentation

1) VLF-EM

The transmitter used is a portable VLF transmitter TX27 manufactured by Geonics, Ltd that supplies a VLF signal operating at 16.55kHz. The output from the VLF generator is fed into a single insulated long wire antenna of a total length of 1000m, which is grounded at both ends galvanic using steel stakes.

A VLF-EM receiver manufactured by Scintrex was used for the VLF survey. The IGS-2/VLF-4 consists of a console, a preamplifier and the sensor itself. The sensor contains 2 air-cored coils in a backpack mounted housing with an electric level for automatic tilt compensation. The error in the vertical in-phase component is less than 1% and for tilts up to +/- 15 degrees. The frequency tuning is automatic and can be tuned to any frequency from 15 to 29 kHz with a band with of 150Hz. The VLF receiver was set to the transmitter frequency of 16.55 kilohertz.

2) Magnetometer

The intensity of the total magnetic field was measured using proton magnetometer G-856AX manufactured by EG&G Geometrics (USA) with a resolution of 0.1nT and an accuracy of 0.5nT. Computerized 3 readings average and subsequent storage improved measurement quality and speed of acquisition. As a base station we used a proton magnetometer G-818 manufactured by EG&G Geometrics (USA) with a resolution of 1nT.

(4) Data acquisition

1) VLF-EM

For magnetic field measurements, the sensor is worn on the back, the console on the chest, and the preamplifier is connected to the console. In the Magnetic field mode, the IGS-2/VLF-4 measures the horizontal magnetic field, the vertical in-phase component and the vertical quadrature component. These 2 vertical fields are normalized by the horizontal field measurement. During data acquisition, the receiver should be oriented in the same direction relative to the transmitter dipole.

2) Magnetometer

Once the stations were located, the magnetometer was calibrated by using the average earth’s magnetic field within the survey area, i.e., by using the global magnetic maps calculated by using the IGRF values. US/UK World Magnetic Chart -- Epoch 2000 in the American Continent, indicating Total Intensity, Inclination and Declination of the region where Uruguay is located.

For the case of magnetic ground survey, the most effective way to measure diurnal variation is using a spare magnetometer left in a quiet location (base station), away from roads, house, power lines, etc and records the magnetic field at regular intervals (around every 5 or 10 minutes). For our case, these readings were taken every 10 minutes with a precision of 1nT.

After the base station was set up, the readings collected along the profile were taking in the survey area together with the time of the event. The time was useful for the correction of the diurnal variations. After the survey, the field data were downloaded to a laptop computer after each day of data collection. The data collected from the base station were directly input to a laptop computer by using the same format of the field survey data.

(5) Data Processing

1) VLF-EM

For detailed interpretation of single line data, the various parameters are generally plotted in profile form. The originally measured data is plot in profiles (i.e. the real and imaginary part of the complex ratio between the vertical and horizontal electromagnetic field Hz/Hx). In the geophysical literature the nomenclature “tilt angle” and “ellipticity” are commonly used instead of “real part” and “imaginary part” respectively. For all practical purposes, however, the real part is equal to the tilt angle, and the imaginary part is equal to the ellipticity. The scale on the ordinate axis is in percent.

The most popular form of presenting data is in the form of stacked profiles. These are simply profiles along each survey line plotted on a map in the same relative position as the lines.

2) Magnetometer

Diurnal Variations

The first processing technique to be applied is the removal of the diurnal variations using the data collected at a base station. The first reading at the base station is regarded as the base value and any variations from this valued at the base station for later times is subtracted or added to the field data. For example, on Fig II-4-3 the diurnal variation curve shows the total magnetic field variation from 11am to 5pm on October 11, 2002. During the survey a maximum variation of about 30nTesla was observed in normal days.

Subtracting the base field from the field readings by assuming equal diurnal variations at both the field and base station carried out diurnal corrections. The position of each reduced readings was then added to the computer file from field notes.

Gridding

After the removal of the diurnal correction and noise values, the corrected data was gridded. The gridding process permits not only an easy visualization of the information but also to simplify and speed up any subsequent processing operations. As it is the case of some geophysical surveys, the sampling spacing of the data collected along lines presented a higher density than between them. In our case, the distance between lines was 100m while the separation between stations was only 10m. The gridding algorithm used to process the present data was the minimum curvature method with anisotropy.

Once the data was converted in grid format, the field magnetic data is then contoured to produce the total magnetic field map (TMI). From this point, further processing of the magnetic data were performed following two distinct approaches, one using 2D spatial filtering techniques and another using quantitative modeling programs along selected profiles. The first has permitted the calculation of the radially averaged power spectrum. The radially averaged power spectrum represents the energy of the measured magnetic field in the different directions. This statistically evaluated energy spectrum in a magnetic map can be divided into different depths contributions: deeper, intermediate/shallow and noise.

Further transformations were also possible by using 2D spatial filtering techniques to certain features in the data. During the filtering process, the following maps were created: Reduction to the Pole (RTP), Upward Continuation and Analytical Signal.

The RTP results were important during this survey because it permits the conversion of a map taken at given magnetic latitude into a map of what would have been seen if the data were taken in a vertical inducing field at the magnetic pole. In other words, the characteristics of magnetic anomalies depend greatly on the direction of the inducing field. Reduction to the pole removes this variable from the maps, putting data taken anywhere on a common footing for interpretation.

The second approach has permitted the characterization through modeling of the main magnetic anomalies encountered. The reference field adopted for the processing of the data was the 2000 IGRF.

Linear Filtering

Filtering techniques are often used to enhance data and make tilt-angle crossovers easy to identify. Two commonly used filtering methods include the Fraser filter and the Karous-Hjelt filter. By using these techniques, the real component (in-phase) component of the secondary can produce a maximum over the crossover point, i.e., the point lying directly over the anomaly.

The most common data processing technique is called Fraser filtering. This filter operator smoothes the data, and applies a phase shift such that a peak is situated above the conductive target, rather than a zero crossing. On the other hand, the Karous-Hjelt (K-H) filter calculates the equivalent source current at a given depth, commonly known as current density. This filter is actually an extension of the Fraser filter to process vertical component of magnetic field.

The K-H filter profiles are obtained by using the linear fit theory to solve the integral equation for the current distribution, assumed to be located in a thin horizontal sheet of varying current density, situated everywhere at a depth equal to the distance between measurement station

We presented the VLF field data as profiles and contour maps. Data can be filtered using either the Fraser or H-J filters.

3-3-4 Trench survey

Trench sketch and 1m-width channel sampling were carried out during trench survey. Sketches were made on 1:200 scales. The samples weighting 2 Kg were taken at the bottom of the trenches by channel sampling. The samples were prepared in the Dinamige laboratory, by drying at 56 degrees Celsius and crushing to 3 mm under. The samples were sent to the Lakefield laboratory in Brazil and 200grams of it were stored at Dinamige. Chemical analysis was carried out for the 31 elements as follows: Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, K, Ag, Na, Sr, Zr, Sn, Ti, W, Li, V, Zn, Cr and Au. The methodology employed for gold analysis was Fire assay-AA and for the others elements were employed strong 4 acid/ICP. The chemical analysis was carried out at the Lakefield Geosol Laboratory in Brasil.

The results from geochemical samples were statistically analyzed. Based on statistical processing, computerized distribution maps were drawn for every elements. The correlation matrices among the elements were also calculated and the Exploratory Data Analysis (EDA) method was applied to define the threshold values (anomalous values) for each element. Factor analysis studies were also utilized for the processing of geochemical data, but the only correlation found was between gold and As.

CHAPTER 4　RESULTS OF LABORATORIES EXPERIMENTS

Thin section, polished section, X-ray, Fluid Inclusion and Ore analysis were carried out during Phase III. Remanent magnetism measurement and chemical analysis for soil geochemical samples were also carried out.

A total of 1,689 soil samples were collected and analyzed during the field survey as shown in the Fig.II-4-1 and Appendix 2.

Results of the polished sections in quartz vein did not indicate any specific mineral association with ore, except a little limonite and a very rare pyrite. A small amount of pyrite– (chalcopyrite) dissemination was recognized in green rocks and in some of the quartz vein.　The quartz vein was classified in three types: milky sugar-like semi-transparent quartz, colorless to white transparent quartz and opaque quartz. Gold were observed in 4 samples.

Fluid inclusion results from 14 samples showed a maximum homogenization temperature of 447.7℃ and minimum of 85.6℃.　The histogram indicated three peaks at around 300℃, 250℃ and 200 to 150℃, which can be considered to correspond to milky semi-transparent quartz, colorless to white transparent quartz and opaque quartz, respectively.　Based on the analytical results, the salinity was 4.2 to 35% (NaCl % equivalent).

A total of 30 samples were analyzed for X-ray, and a total of 30 polished samples were analyzed.

A total of 30 fluid inclusions samples indicated a minimum homogenization temperature of 149℃ and a maximum of more than 350℃. The average results were as follows: 11 samples between 150℃ and 200℃, 8 samples between 200℃ and 250℃, 6 samples between 250℃ and 300℃ and 3 samples between 300℃ and 350℃. The salinity results were between 0.6% and 23% and 16 samples showing salinity between 0% and 10%, 8 samples between 10% and 20% and 6 samples between 20% and 23%.

6 Remanent magnetization samples were taken from Mahoma East area and 5 samples were taken from Andresito area. The samples were from aplite, granite, granodiorite, schist, dolerite, metabasalt and gabbros. Basic rock as dolerite, metabasalt and gabbros shows high magnetic intensity in the order of 10^{-4} and 10^{-2} kA/m in contrast with lower magnetic intensity of 10^{-6}～10^{-7}kA/m observed in aplite, granite and granodiorite.

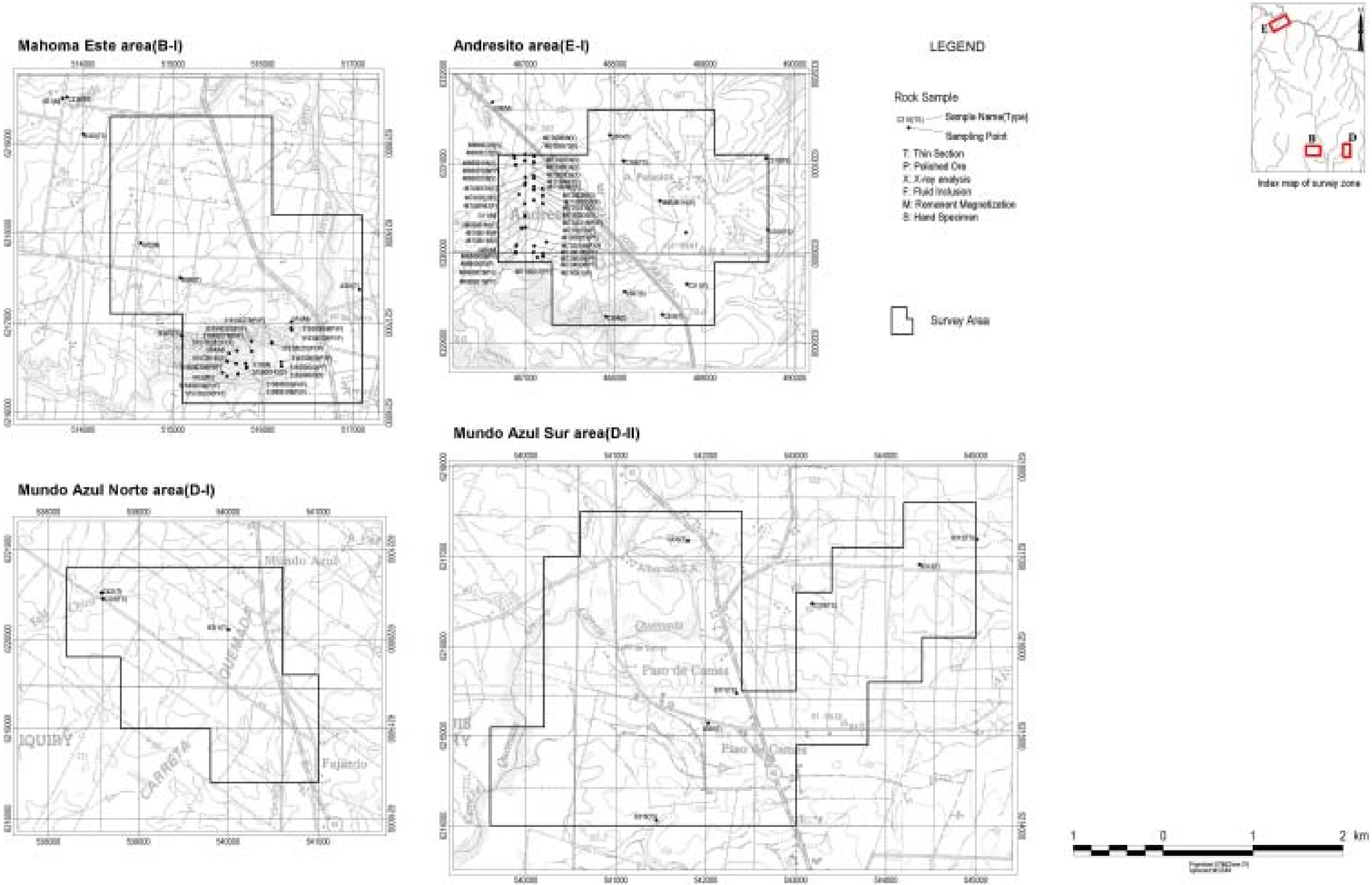


Fig. II-4-1 Location map of rock samples for laboratory experiments

CHAPTER 5　RESULTS OF MAHOMA EAST AREA SURVEY

5-1 Geological mapping

San Jose greenstone rock (pCCsjo) was observed at northeastern and southern part of the survey area, granite (pCC) at southwestern part and southern part. Aplitic dykes, granitic dykes and dolerite dykes were observed within granite (pCC) (Fig.II-5-1).

Biotite schist and greenschist, locally filled by lenses of quartz veins and silicified rocks, essentially compose San Jose unit. General schitstosity is N70W plunging 30 degrees to south, and it changes at the proximity of the granitic intrusion showing the same direction of the intrusive body. Thin section confirmed an original dacite and andesite rocks assemblage for the metamorphic rocks, and also some schist samples have terrigenous and tuff origin. Secondary minerals as, quartz, plagioclase, actinolite, muscovite and chlorite were formed due to metamorphism. Granites rock was strongly altered for muscovite rich rocks and show alteration minerals as chlorite and epidote. Mylonite texture were identified in several microscopic samples and also showed fluorite, zircon and apatite. Strong magnetic diabase dyke showing ENE-WSW direction is intruded in granite (pCC). Trench survey confirmed many diabase dykes along ENE-WSW direction as well as many pegmatite veins and aplite dykes.

5-2 Soil geochemical prospecting

5-2-1 Survey area and amounts

A total of 399 soil samples were taken from Mahoma East area (Fig.II-5-2) and (Fig.II-5-3) and Appendix 3.

5-2-2 Results of statistical data treatment

Statistical data treatment was performed for Mahoma East area (Appendix 4). Between 31 elements (Ag, Sb, B, Bi, Be, Mo, Sn and W) indicated values of less than the detection limit for most of the samples. Correlation coefficients were calculated in order to clarify the relation among elements. As results, there are no elements among the analyzed elements that correlate with gold.

Based on the results of statistical data treatment, the threshold values were determined by cumulative frequency and EDA methods. The following is the threshold values for each element.

Au:12ppb	As:10ppm	Cu:18ppm	Pb:40ppm
Zn:52ppm	Ba:85ppm	Cd:2.0ppm	Sr:30ppm
Li:20ppm	Cr:18ppm	Co:8ppm	Ni:8.5ppm
V:39ppm			

All values above the threshold values of Au: 12ppb were considered gold anomalies (Appendix5).

On this basis, it was confirmed large gold anomalies in soil along E-W trend. The anomaly presents an amoeboid form with 800m extensions along E-W and 500m extensions along N-S directions.

Factor analysis was examined by multi-element analysis. Relationships between elements and factors were extracted by the factor analysis and the result is shown on Appendix 5.

The relationship among the different elements are as follows:

Factor 2：Fe-Pb

Factor 3：Cr-Ni

Factor 4：Mg-Zr

Factor 5：Cu-Mg-Ni

Factor 6：Co-Fe-Ni

5-2-3 Results of soil geochemical prospecting

The gold soil anomalies map is shown in the Fig.II-5-3 and Fig.II-5-4.

Gold anomalies were confirmed within granite rocks that outcrop at the southern part of the survey area. Gold anomalies are present at the proximities of the border with San Jose unit in the southeastern part of the granite. Others small anomaly spots are present inside San Jose unit. Gold threshold value was 12ppb and the maximum value was 96ppb. The disposition of the gold anomalies approximately overlaps the linear magnetic anomaly detected during Phase II airborne survey. Consequently, a relationship between gold anomalies and magnetic structure was considered.

5-3 Geophysical survey

5-3-1 Location and amount of survey

Fifteen survey lines for ground magnetic and VLF survey were set, as shown in Fig.II-5-5, they were oriented along NS direction and spaced 100m between lines and the survey stations was every 10m. A total of 10.9 kilometers of line were surveyed both by Magnetic and VLF surveys.

5-3-2 VLF survey

VLF data were collected at the same stations as the magnetic data. 15 survey lines and a total of 10.9 kilometers of line were surveyed, as shown in FigII-5-6.

Traditionally the interpretation of VLF measurements has been based directly on In-phase and out of phase results along every profile. To make less difficult the interpretation, different types of filtering techniques have been used to extract useful information. We used two filters, Fraser and Karous and Hjelt (K-H), with both of them giving almost same results. The K-H filter was also used to get information on the way the current densities vary with depth, thus obtaining a pseudo depth section for every profile. A clear and remarkable anomaly was detected along a trending oriented

NNE through the central part of the survey area. The 2-D magnetic model result indicated that this structure may represent a dipping dolerite dyke. All the magnetic profiles show the same kind of pattern indicating that the most important source of magnetic intensity is due to the existence of the dolerite dike with maximum amplitude of about 1200nTesla (peak to peak). Both RTP and Fraser map indicate the possibility of mineralization in places of low-high conductivity and low-high magnetic intensity that may be associated to the emplacement of a dyke structure associated probably to a controlled deposition of mineralization. The cause s of minor features on the north and south of the central lines (800E ~ 1000E) of the VLF Fraser results are unclear but it is unlikely that they are related to faults.

5-3-3 Magnetic survey

The results of the magnetic survey are shown in Fig.II-5-7 in the form of stacked profiles of the total magnetic field map (TMI).

The ground magnetic grid were processed to reduce it to the north magnetic pole, a process that causes magnetic anomaly highs to be centered over the causative bodies and gradients to occur over boundaries between magnetically different units. The RTP map shows a pattern of magnetic highs (red) distributed almost along a trend against a background of intermediate (green) to the north and low (blue) to the south that represents the local absence of magnetic rocks.

Chiefly a dolerite dyke underlies the trend of magnetic high, while the zones of magnetic lows are inferred to be associated with green-schist zone. Areas of intermediate magnetic intensity are extensions of the high magnetic and interpreted to be caused by granite.

In the north part of the survey area, the magnetic anomaly trend changes from NNE-SSW to NE-SW with an unclear continuity but suggesting that the dolerite dyke may extend further towards NE. To see this in more detail the important positive structure oriented NE, a 2D analysis of the profile 600E was carried out. Results of the modeling (Fig II-5-7) together with the geologic mapping indicate that these anomalies lie directly over an inclined dolerite dike that has intruded the granite/granodiorite rocks of the area. According to the 2D model of the section along 600E, the maximum width of the dike is between 20 and 25m and dipping about 50 north. The dolerite contains much more magnetite than is found in the bordering granite rocks. The shape of a magnetic anomaly over a dike depends on the strike and dip of the dike and the inclination and declination of the earth's main magnetic field. The magnetic susceptibility used for the diorite resulted in 0.0124 in the SI system.

All of the profiles shown in the Fig.II-5-8 as stacked profiles, suggests the same pattern of anomaly seen in the 2D model mentioned above

5-4 Trench survey

5-4-1 Survey area and amount

Trench survey were performed in areas where overlapping of soil geochemical anomaly and VLF-EM anomalies were confirmed. The location map of trenches is presented on Fig.II-5-8.

Trench number	Direction	Length	Volume
Trench 515600	N-S	240m	410.85m^3
Trench 515700	N-S	350m	451.60m^3
Trench 515800	N-S	325m	463.94m^3
Trench 515900	N-S	400m	467.95m^3
Trench 516000	N-S	200m	328.25m^3
Trench 516100	N-S	350m	466.70m^3
Trench 516200	N-S	250m	364.15m^3
Trench 516300	N-S	30 m	265.45m^3
Total		2245 m	3,218.89m^3

5-4-2 Geology

Results of the trench survey are shown on Fig.II-5-9, and the trench sketches are shown on Appendix 8.

(1) Soil

Trench survey results clarified that the soil can be classified into the horizons A, B and C, locally the horizon C is not present. The A soil which is black clayey, corresponds to the uppermost horizon presenting in general, mixed fragments of quartz veins and weathered granite. The C-horizon is generally yellowish and it is a transition horizon to the fresh rock or weathered rock, so locally it shows structures as quartz veins and shear zones, frequently related to gold mineralization.

(2) Host rock

Muscovite granite is the principal rock present in the trench area and the San Jose unit surrounds it in the southeastern part. The granite present several aplitic dike and pegmatite veins, and also it is intruded by diabase dykes. Thin section confirmed quartz, K-feldspar, muscovite and plagioclase, and also it was confirmed presence of fluorite and zircon.

Schist and green rock represent the San Jose formation that is widely distributed at the southeastern part of the survey area.

Diabase dyke of different thickness and ENE-WSW disposition were confirmed in the trench area and it presents a strong magnetism.

(3)Geological structure

Stereo net interpretation was carried out aiming to understand the geological structure of the survey area. The rose diagram of the survey area shows strong E-W structures followed by NE and NW structures (Fig.II-5-10). Trench survey confirmed ENE-WSW direction shear zones and quartz veins within granite (pCC). The shear structure is near vertical and locally it presents sericite-pyrite in the edge of quartz veins. These shear structures were later intruded by diabase dykes.

(4) Mineralization

1m-wide channel samples taken from trenches showed gold anomalies in quartz veins and in diabase dike borders, as follows.

Trench 515700: 94m～96m(w:2m)0.15ppm, 117m～118m(w:1m)0.2ppm, 122m～123m(w:1m) 0.21ppm, 150m～151m(w:1m)0.20ppm, 176m～177m(w:1m)0.23ppm, 215m～216m(w:1m) 0.21ppm, 266m～269m（w:3m）0.13ppm, 276m～277m(w:1m)0.16ppm, 311m～313m(w:1m) 0.27ppm in intervals of granite and diabase presenting lenses and fragments of quartz veins.

Trench 515800: 75m～76m(w:1m)0.48ppm, 83m～84m(w:1m)0.31ppm, 94m～95m(w:1m) 0.54ppm, 107m～109m(w:2m)0.25ppm, 126m～127m(w:1m)0.31ppm in intervals of granite and diabase presenting lenses and fragments of quartz veins.

Trench 515900: 126m～127m (w:1m)0.18ppm, 133m～134m(w:1m)0.17ppm,181m～186m（w:5m）0.31ppm, 210m～211m(w:1m)0.14ppm, 225m～228m（w:3m）0.24ppm, 240m～241m (w:1m)0.14ppm, 248m～249m(w:1m)0.14ppm, 251m～253m（w:2m）0. in intervals of granite and diabase presenting lenses and fragments of quartz veins.

Trench 516000: 76m～77m(w:1m)0.19ppm, 182m～183m(w:1m)0.18ppm14ppm31ppm in intervals of granite presenting lenses and fragments of quartz veins.

Trench 516100: 7m～8m(w:1m)0.34ppm, 158m～160m (w:2m) 0.26ppm18ppm14ppm31ppm in intervals of granite presenting lenses and fragments of quartz veins.

Observation of Polished section showed milky quartz vein with no associated minerals related to the gold mineralization. Fluid inclusion indicated a homogenization temperature of 197.3 ℃ and a salinity of13.6 % NaCl. Fluid inclusion of quartz veins confirmed the presence of quartz, smectite and sericite (Appendix 1).

5-4-3 Interpretation results

Statistical data treatment was performed for trench survey results (Appendix 9 and 10). Among the 31 elements analyzed, Ag, Sb, B, Bi, Cd, Mo, Sc, Sn and W indicated values of less than the detection limit for most of the samples. Correlation coefficients were calculated in order to clarify the relationship among elements. As results, there was found only As showing low correlation (0.254) with gold.

Based on the results of statistical data treatment, the threshold values were determined by cumulative frequency and EDA methods. The following are the threshold values for each element.

Au:47ppb	As:23ppm	Cu:42ppm	Pb:70ppm
Zn:53ppm	Ba:57ppm	Ca:0.12%	Sr:20ppm
Li:80ppm	Cr:90ppm	Co:30ppm	Ni:36ppm
V:90ppm	Mg:0.20%	Mn:0.05%	Ti:0.5%
Y:12ppm	Zr:170ppm		

All values above the threshold values of Au: 47ppb (Appendix 11) were considered gold anomalies. As a result, it was confirmed wide gold anomalies in rock along E-W trend, which is probably related to quartz veins zones. Gold anomaly presents an E-W trend extended about 500m and presenting its highest gold value is 745ppb.

5-4-4 Compilation of trench survey results

Shear zones from decimeter to several meters width and ENE-WSW direction were identified by trench survey. Diabase dykes with maximum width of 26m are intruded in these shear structures. Gold anomalies were confirmed in granite and diabase showing quartz veins and quartz veinlets, with maximum gold grade of 745ppb in 1m-wide sample. On trench 516100, diabase dyke showed clayey alteration and silicification in its margin with granite (pCC). On trench 516300, were found dykes of granite (pCC) intruded in the San Jose formation (PCCsjo).

The following results were confirmed in 1m-wide channel samples taken from trench bottom.

Trench 515700: Au 0.15ppm(w: 2m), 0.2ppm (w:1m), 0.21ppm(w:1m), 0.20ppm (w:1m), 0.23ppm (w:1m), 0.21ppm (w:1m), 0.13ppm(w:3m), 0.16ppm (w:1m) and 0.27ppm (w:1m), **Trench 515800:** Au 0.48ppm (w:1m), 0.31ppm (w:1m), 0.54ppm (w:1m), 0.25ppm (w:2m), 0.31ppm (w:1m). **Trench 515900:** Au 0.18ppm(w:1m), 0.17ppm (w:1m), 0.31ppm(w:5m), 0.14ppm (w:1m), 0.24ppm(w:3m), 0.14ppm (w:1m), 0.14ppm (w:1m), 0.14ppm (w:2m). **Trench 516000:** Au 0.19ppm (w:1m), (w:1m)0.18ppm. **Trench 516100:** Au 0.34ppm (w:1m), 0.26ppm（w:2m）were confirmed in intervals of granite and diabase presenting lenses and fragments of quartz veins.

5-5 Considerations

San Jose greenstone rock (pCCsjo) is composed essentially by biotite schist and greenschist, and locally presents lenses of quartz veins and silicified rocks (Fig.II-5-13). San Jose unit is distributed in the northeastern part and in the southern part of the survey area while granite (pCC) was observed in the southwestern part and southern part of the same area. Aplitic dykes, pegmatite veins and dolerite dykes were observed within granite.

Soil geochemical prospecting confirmed wide gold anomalies within granite rocks (pCC) that outcrop at the southern part of the survey area. Gold threshold value in the area is 12ppb and the maximum gold value is 96ppb. Gold anomalies are present at the proximity of the border with San

Jose units in the southeastern part of the granite. The detected anomalies approximately overlap the linear magnetic anomaly detected during Phase II airborne survey. Others small anomalies are present as small spots inside San Jose unit.

VLF-EM and magnetic geophysical survey carried out within gold anomalies detected by soil geochemical anomalies confirmed linear magnetic and linear VLF anomalies that overlap the magnetic anomaly detected during Phase II airborne survey. Trench survey confirmed that high magnetic anomaly and low VLF-EM anomaly are associated with diabase dykes.

Several shear zones with ENE-WSW direction were identified by trench survey. Diabase dykes with maximum width of 26m mixed with quartz veins fragments were found in these shear structures.

The maximum gold value in trenches was 745ppb for 1m-wide channel sample. Others channel samples confirmed the following results; trench 515600 (gold between 0.13ppm and 0.75ppm), trench 515700 (gold between 0.13ppm and 0.27ppm), trench 515800 (gold between 0.25ppm and 0.54ppm), trench 515900 (gold between 0.14ppm and 0.31ppm).

Fig.Ⅱ-5-1　Geological map of Mahoma Este area

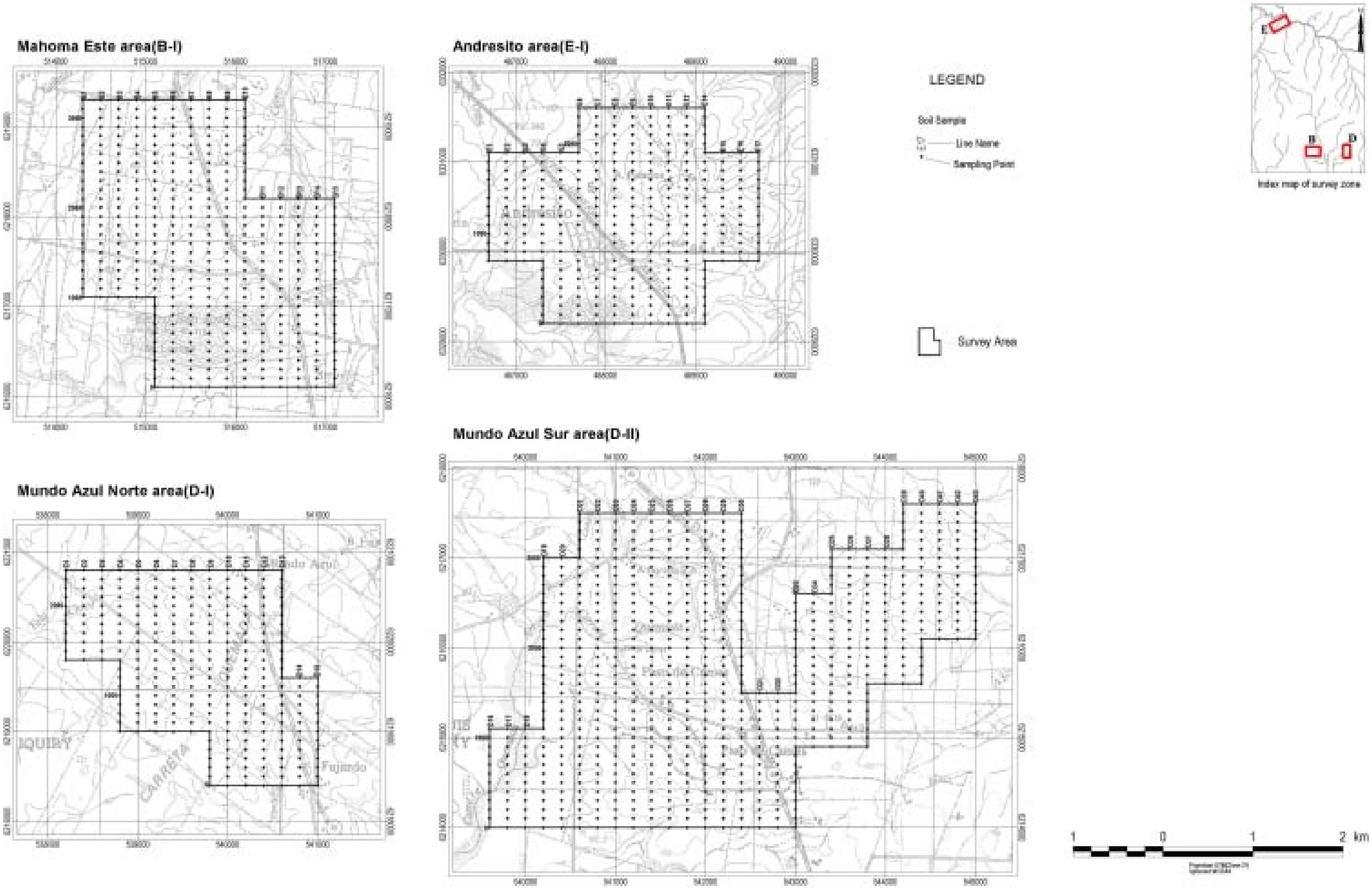


Fig.Ⅱ-5-2　Location map of soil samples

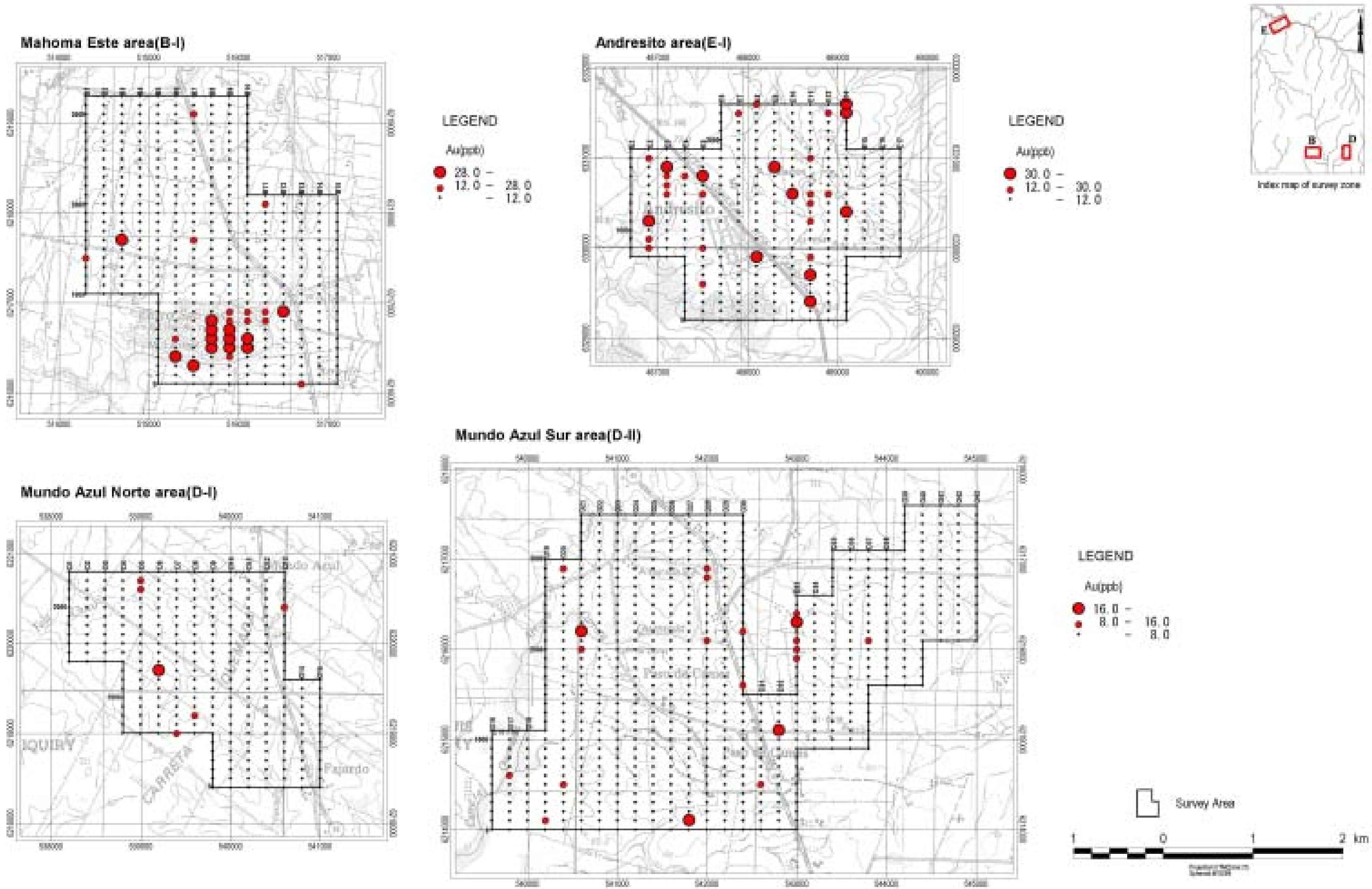


Fig.Ⅱ-5-3　Distribution map of Au anomalies of soil samples

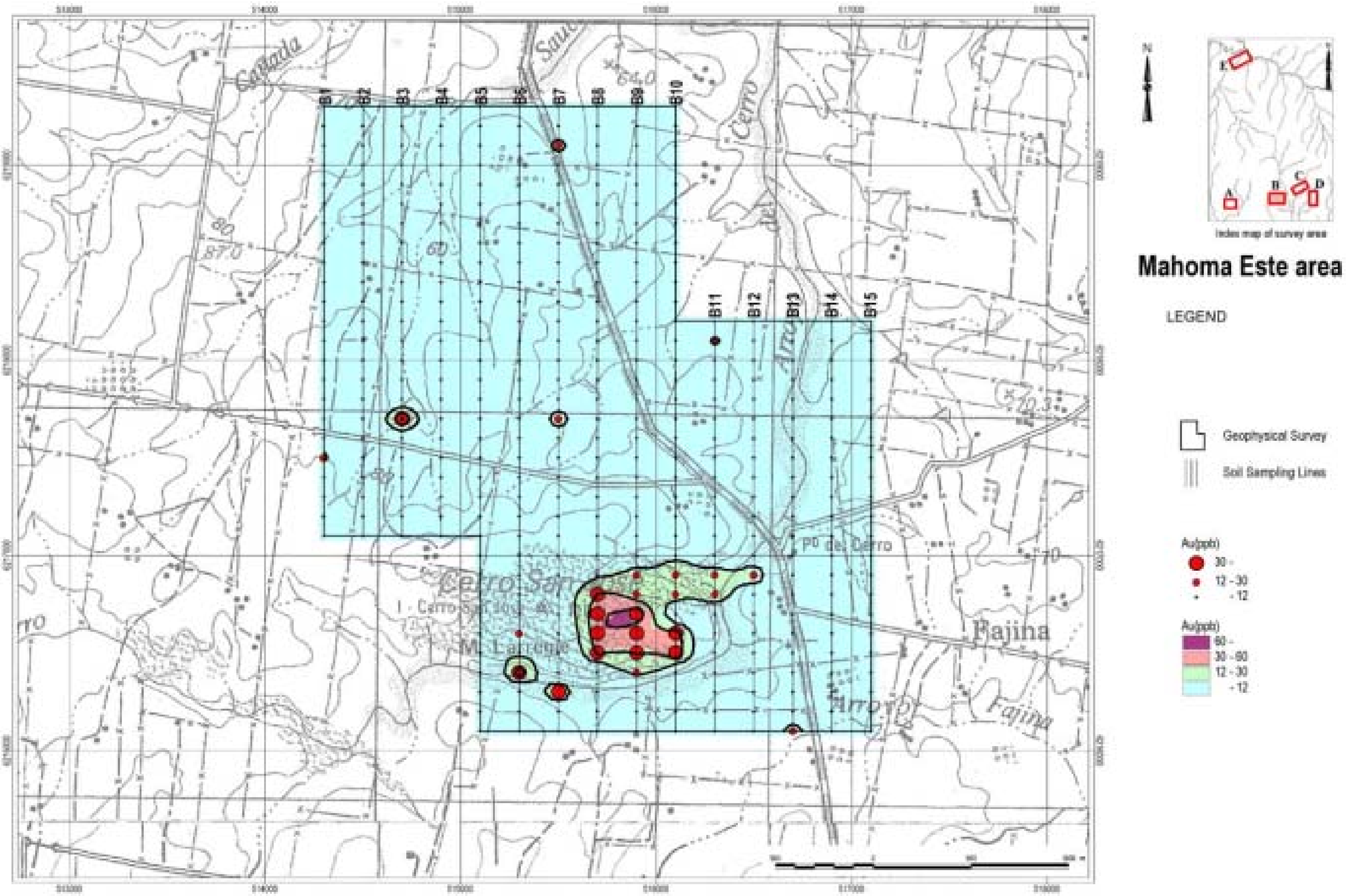


Fig.Ⅱ-5-4　Result of soil geochemical survey in Mahoma Este area

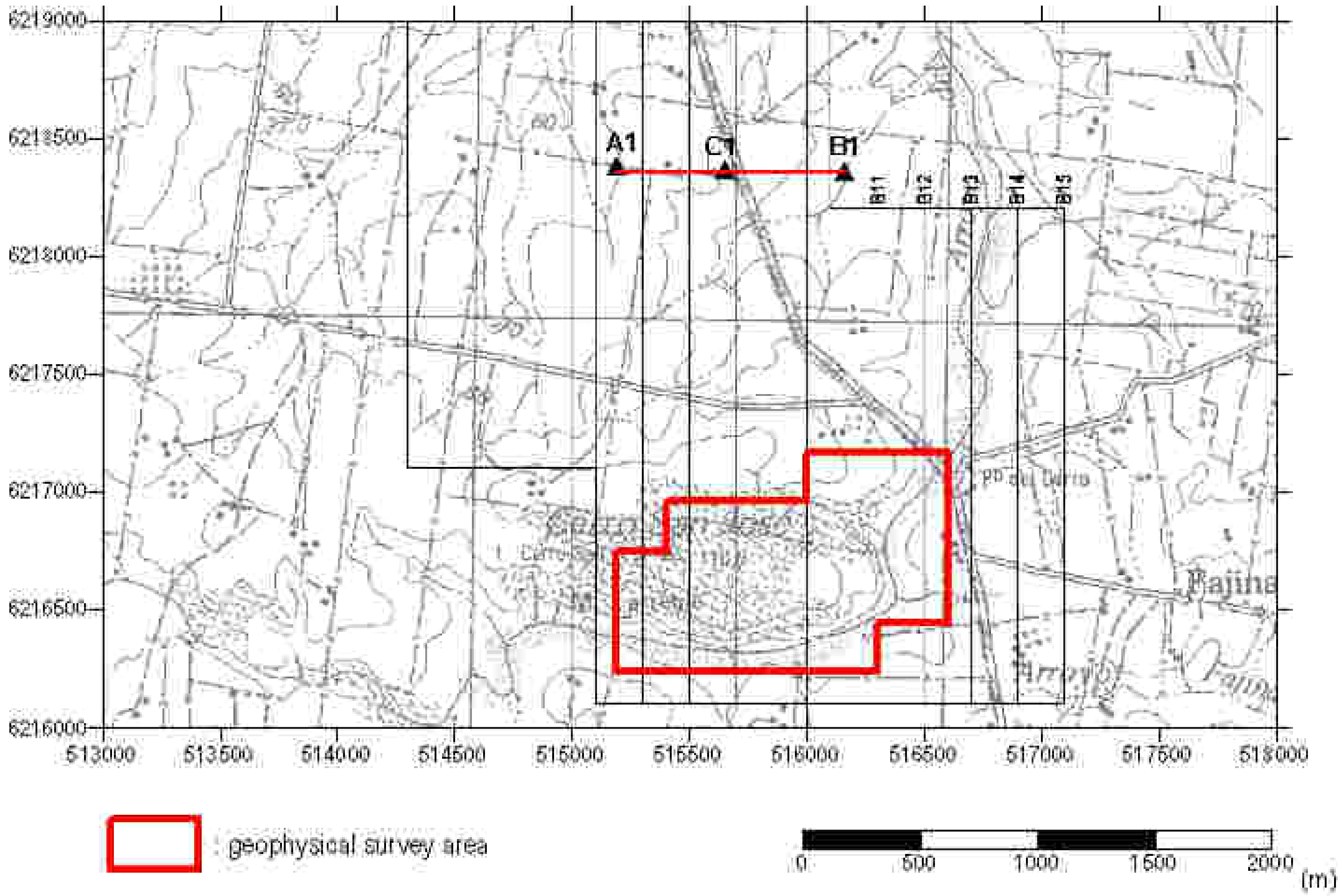
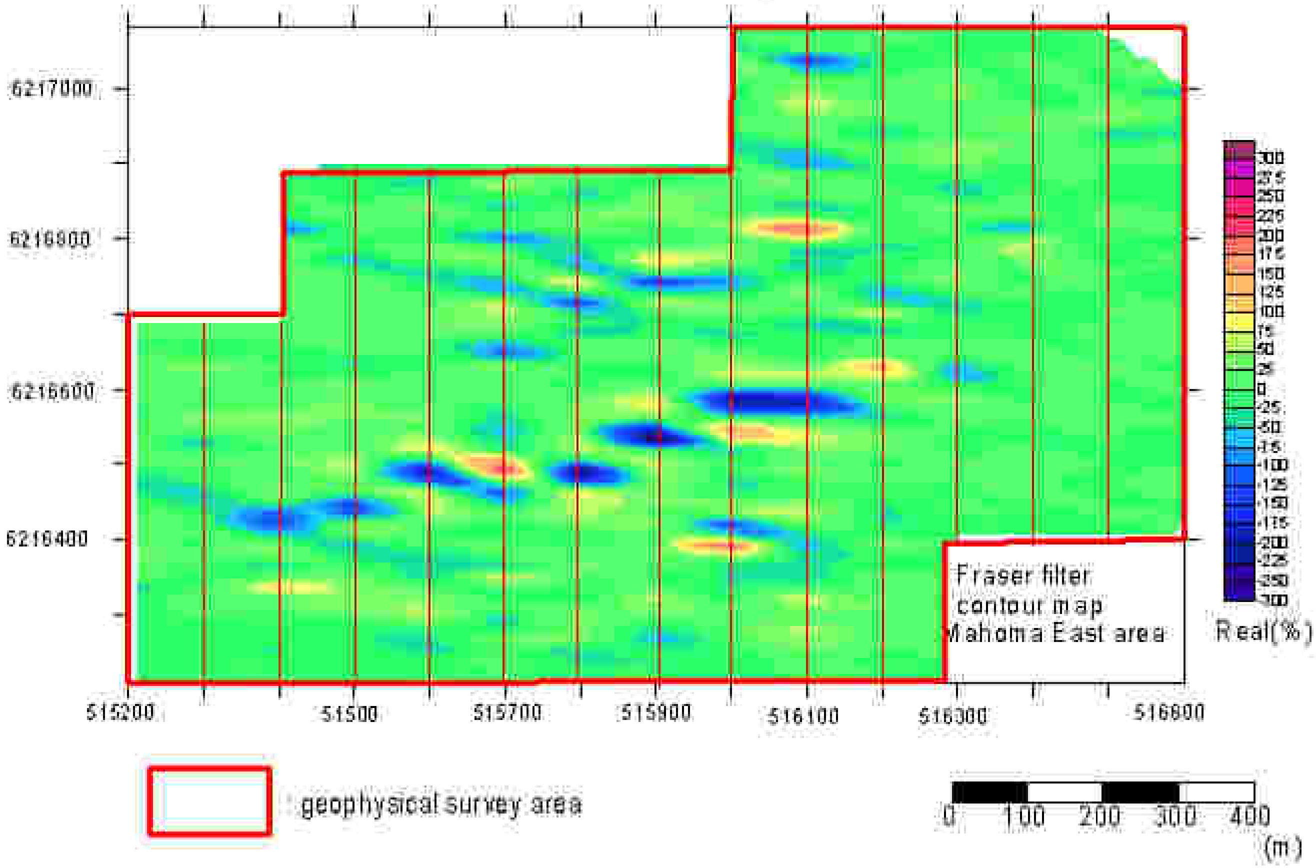


Fig.II-5-5 Geophysical survey area and transmitter dipole in Mahoma Este area

Fraser filtered map



Equivalent current density pseudo-section along profile 516000

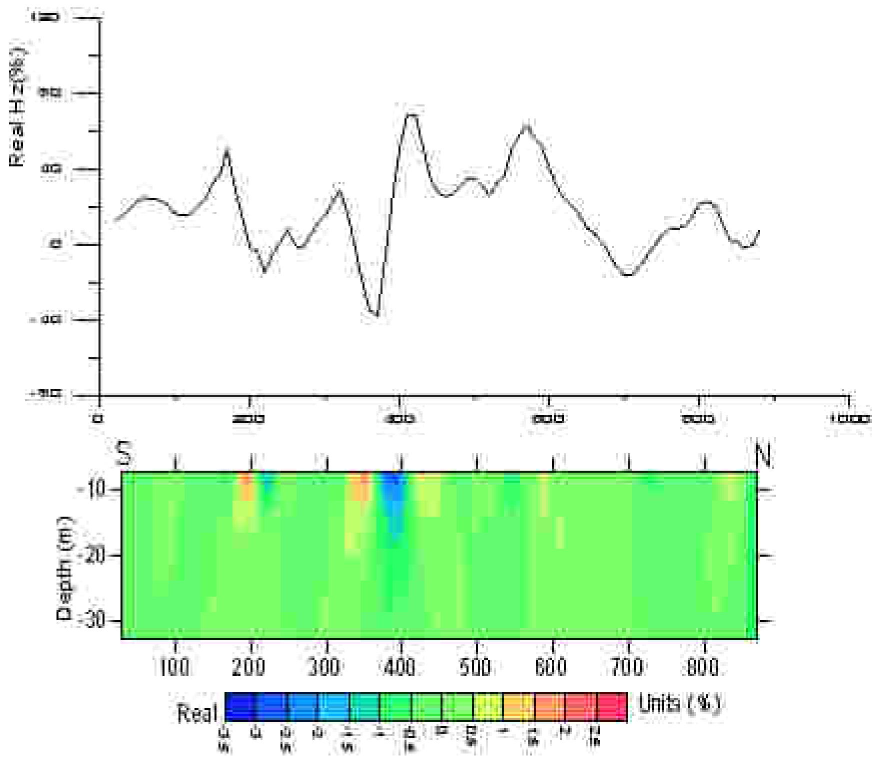


Fig.II-5-6 VLF filtered results in Mahoma East area

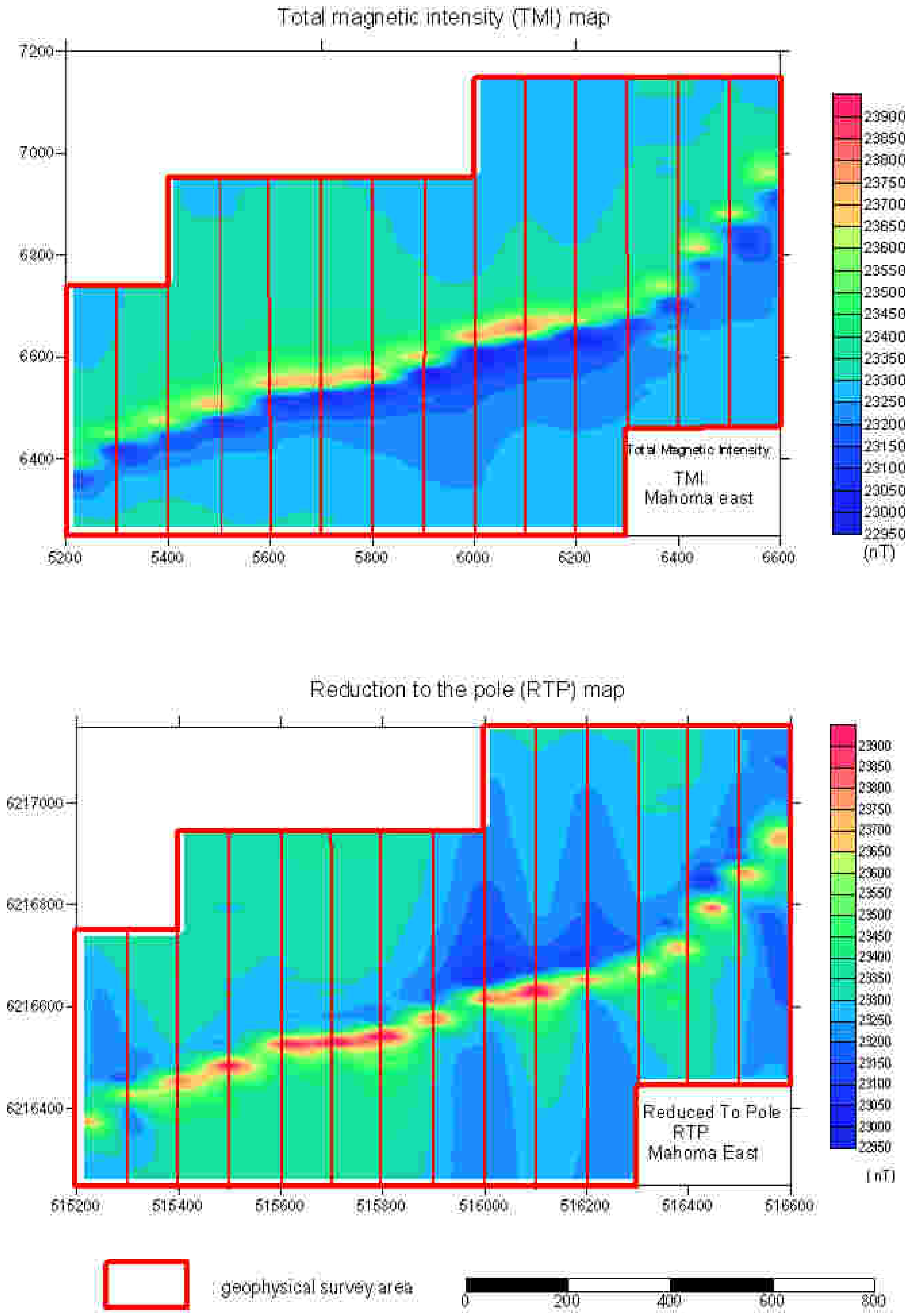


Fig.II-5-7 Total magnetic intensity and reduction to the pole in Mahoma Este area

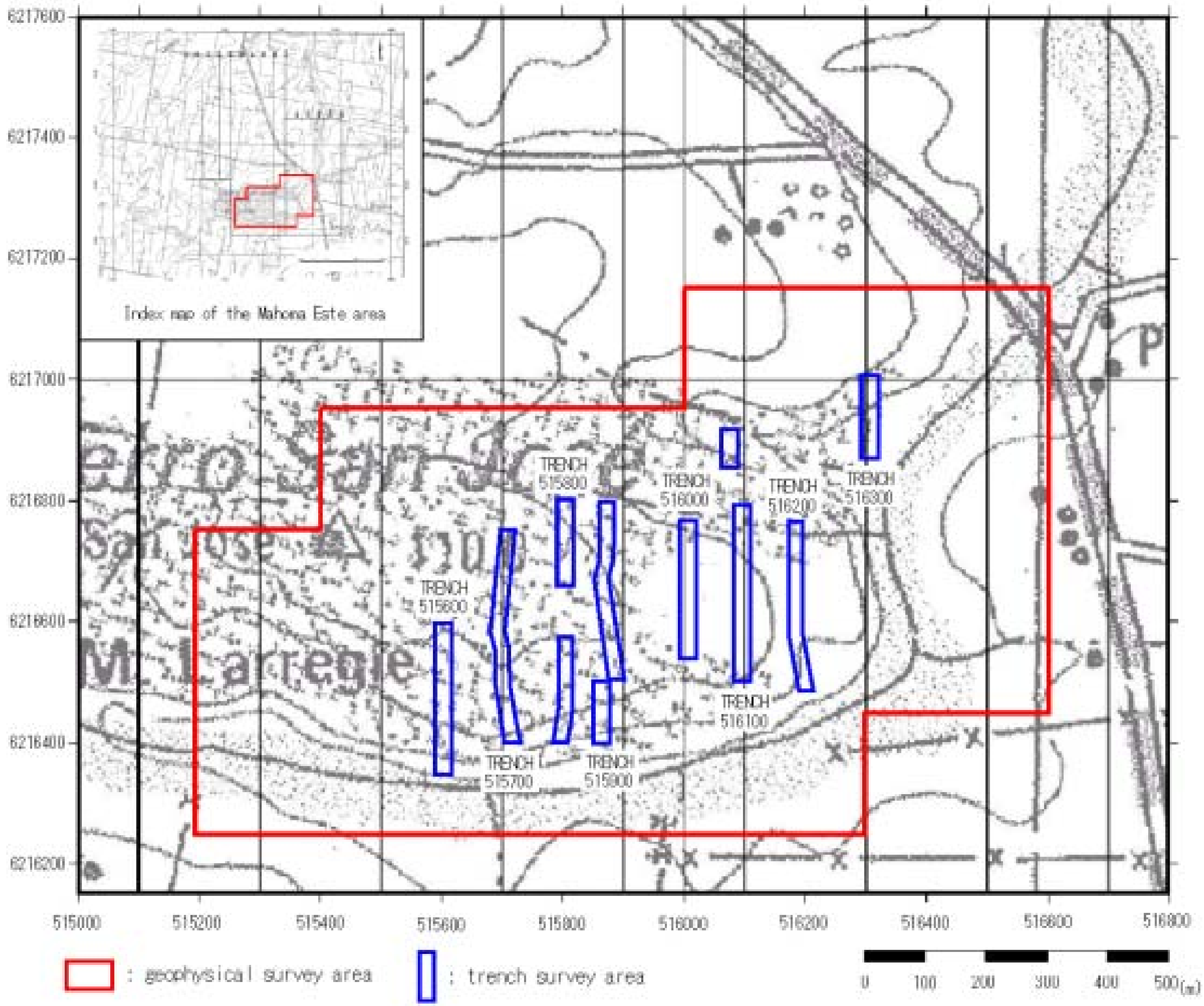


Fig. II-5-8　Location map of trench in Mahoma Este area

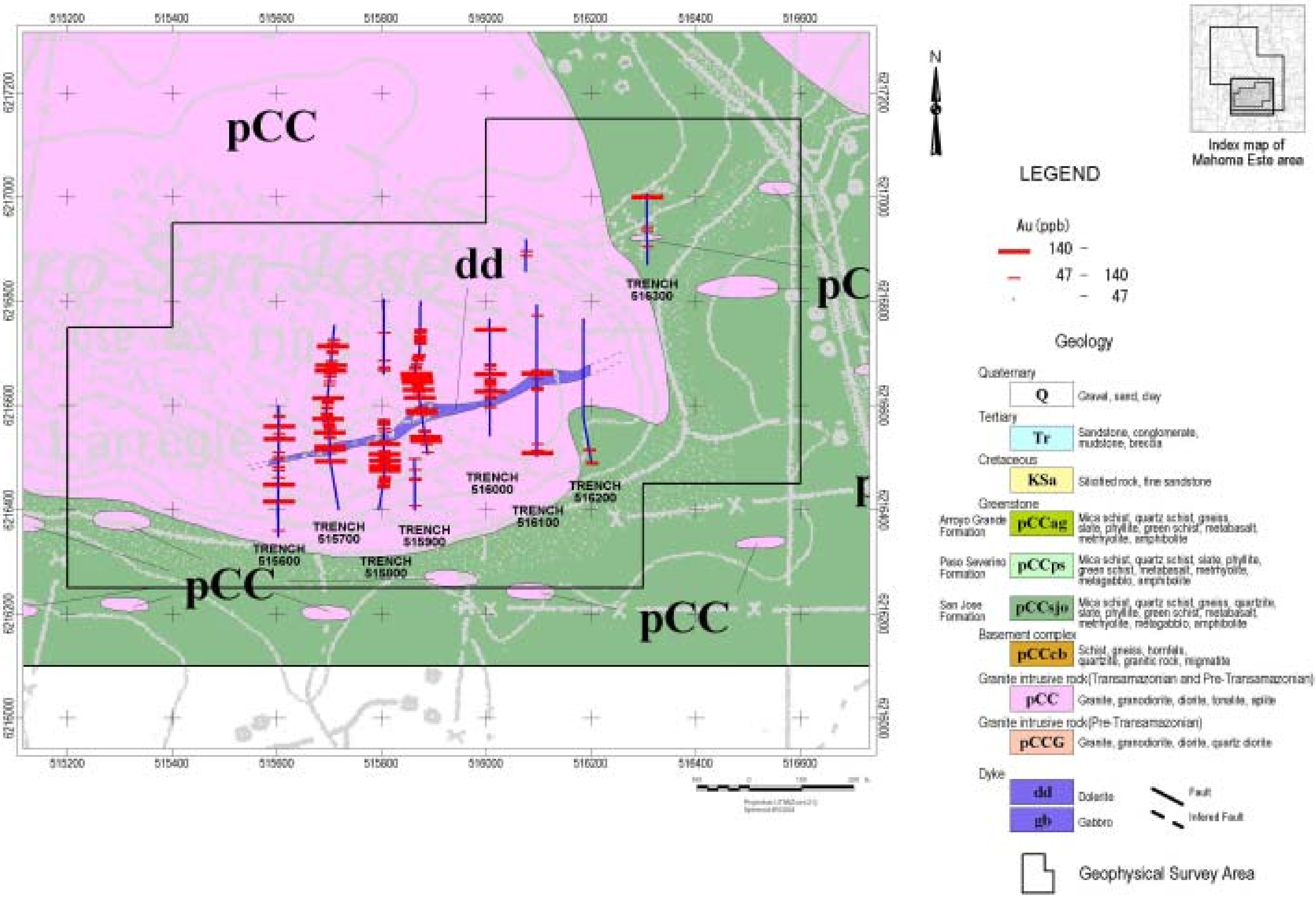


Fig.II-5-9　Distribution map of Au anomalies from trench rock samples in Mahoma Este area

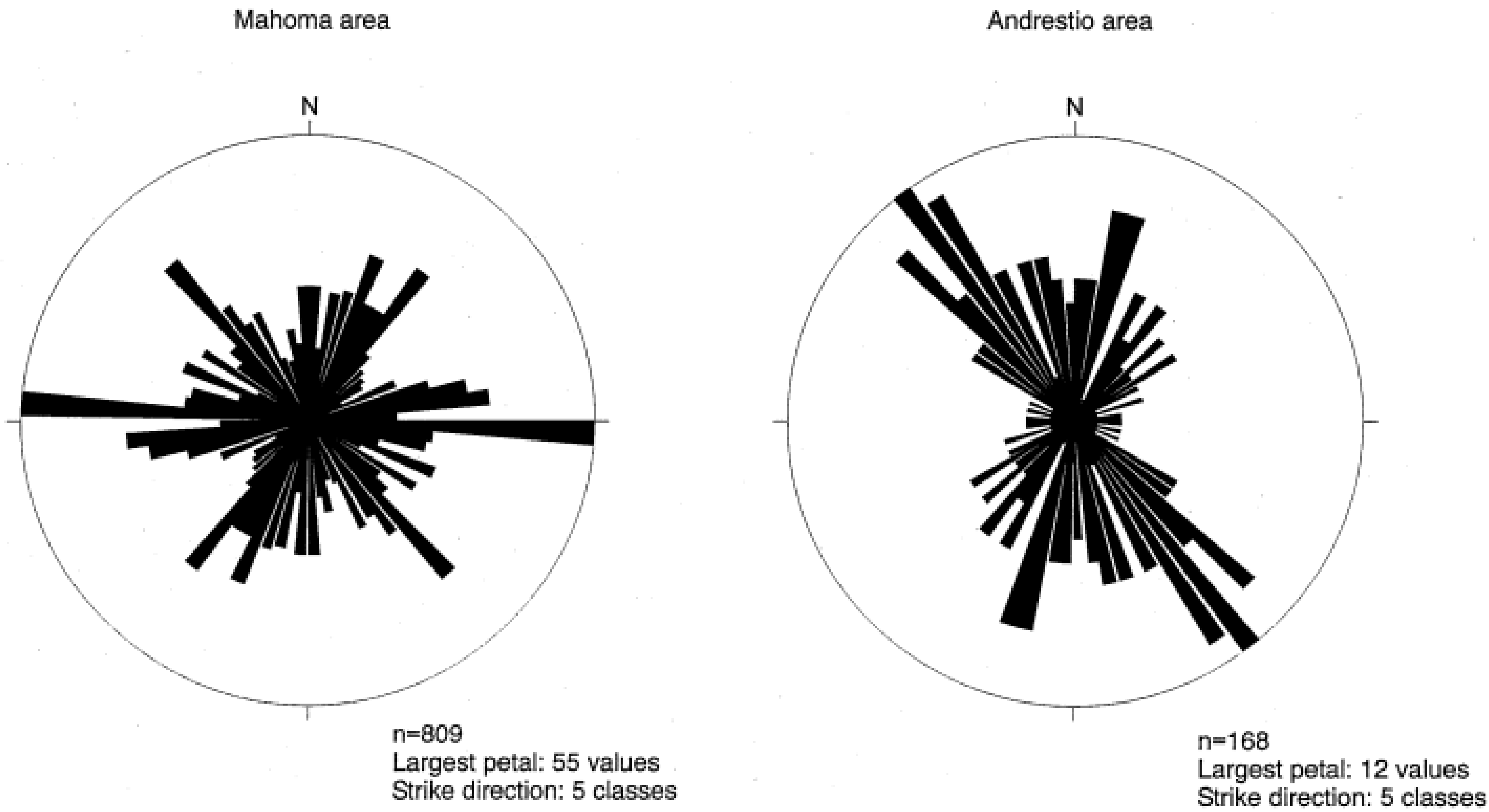


Fig.Ⅱ-5-10　Rose diagrams of Mahoma Este and Andresito area

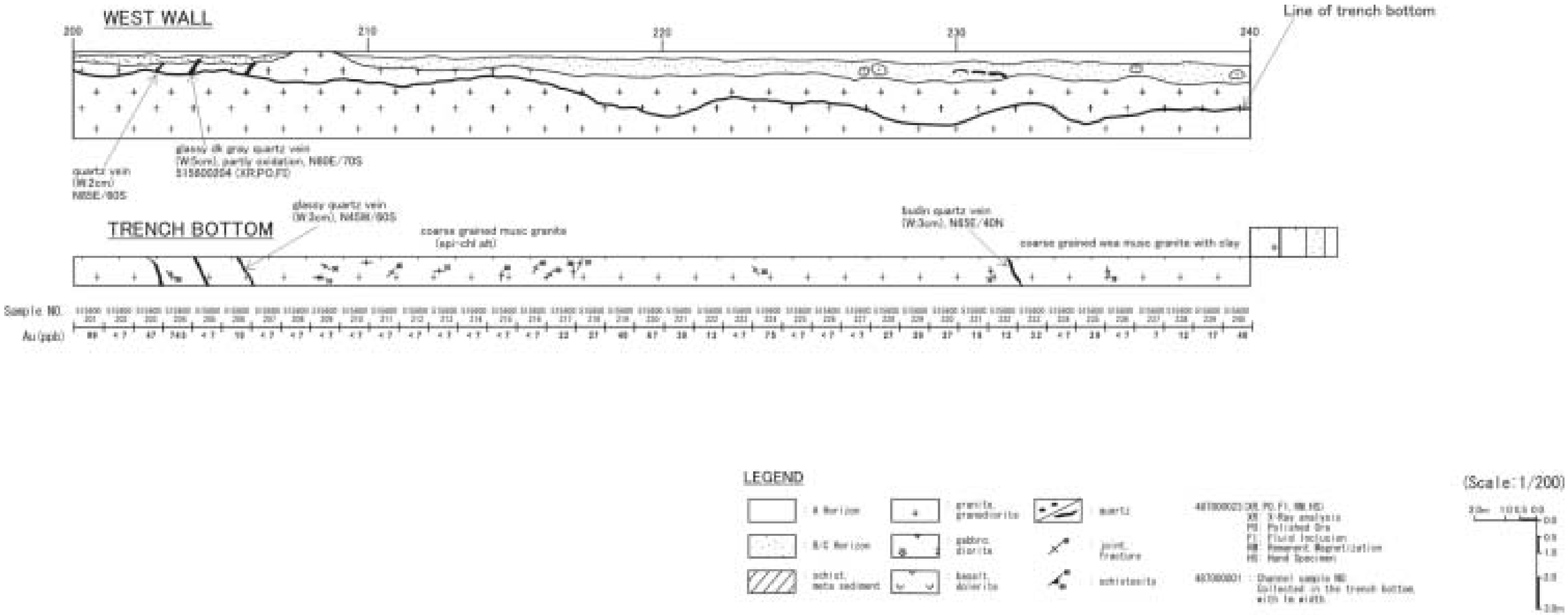


Fig. II-5-11 Sketch of trench 515600(200-240m) in Mahoma Este area

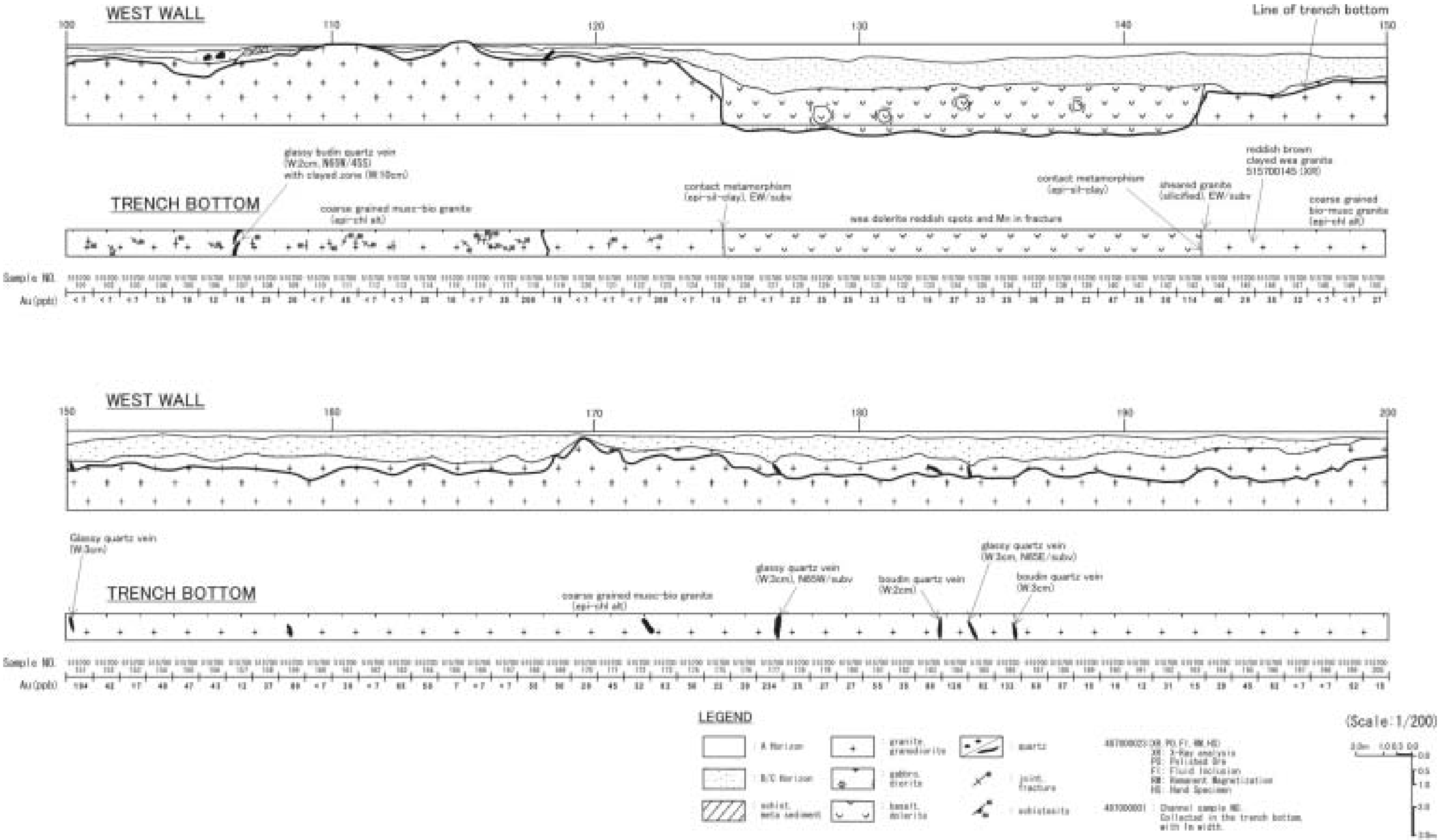


Fig. II-5-12 Sketch of trench 515700(100-200m) in Mahoma Este area

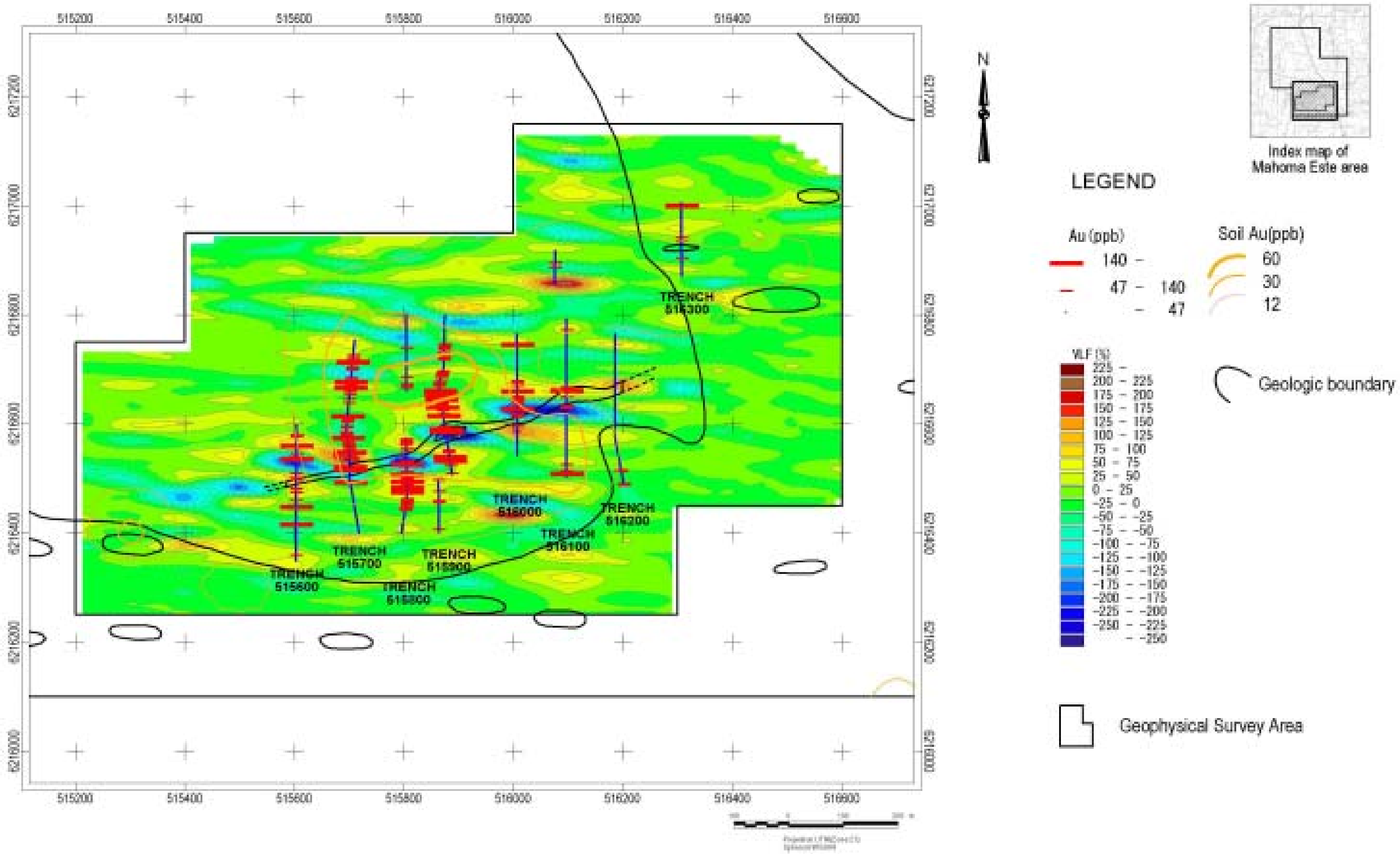


Fig.Ⅱ-5-13　Composite map of survey results in Mahoma Este area

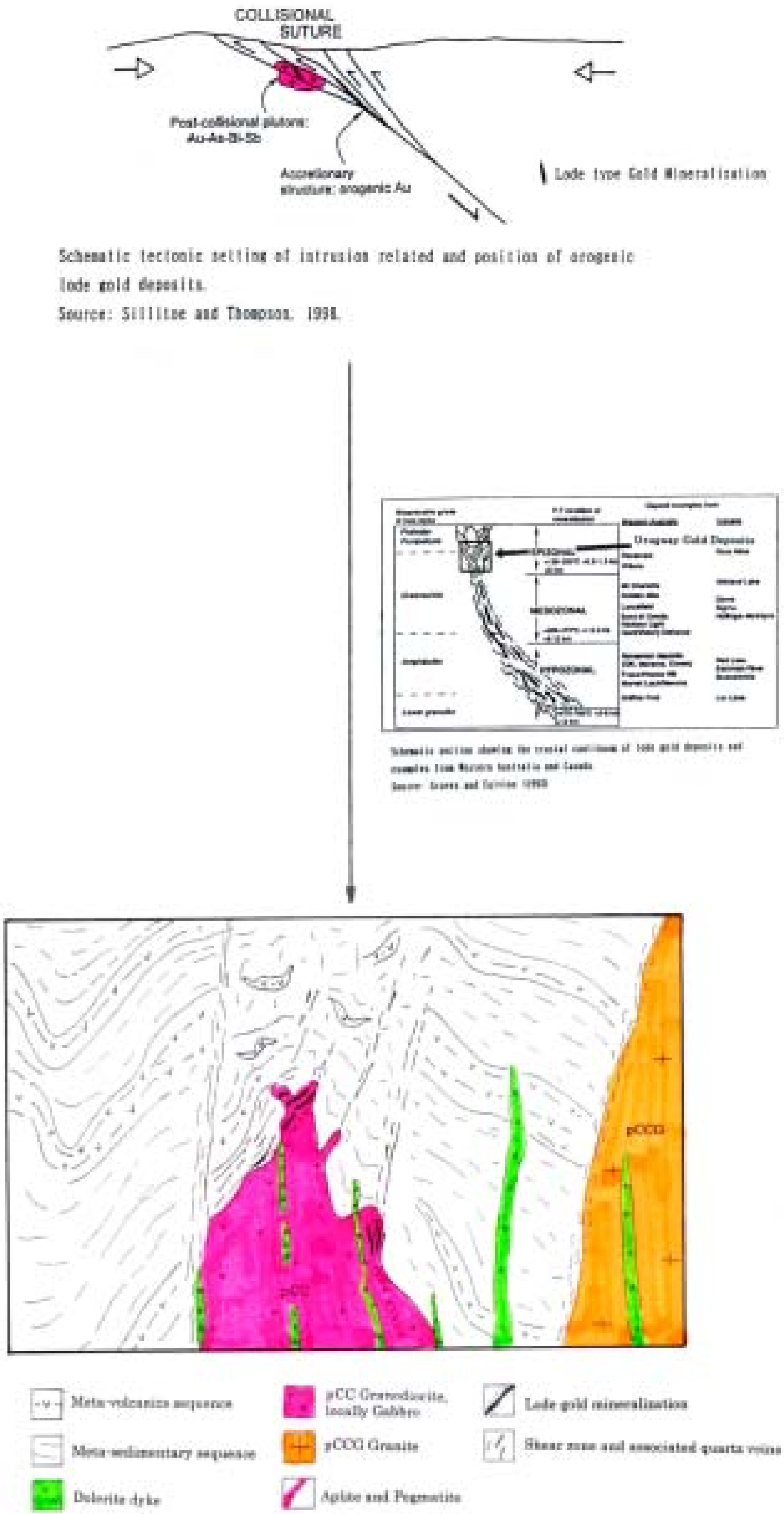


Fig. II-5-14　Schematic model of gold mineralization in San Jose and Arroyo Grande area

CHAPTER 6　RESULTS OF ANDRESITO AREA SURVEY

6-1 Geological mapping

Arroyo Grande greenstone rock (pCCag) is widely distributed in the survey area, with granite (pCC) at southern part and ancient granitic rock(pCCG) at northwestern part (Fig.II-6-1). Migmatite and strong metamorphism was observed in ancient granite and dolerite dyke was observed within granodiorite intrusion. Aplite, granodiorite and dolerite dykes were observed within greenstone rock.

Trench survey showed wide distribution of metabasalt, metasediment and schist in the northwestern part of the survey area. Sedimentary rock was strongly silicified, forming silicified layer that is similar to quartz veins.

Granodiorite intrusion shows lower silica content at its northern border and at these places it presents a gabbro texture. Opposite to the ancient granite, metamorphism alterations were not detected within granodiorite, showing only chloritization and epidotization. Low dip quartz veins with approximate E-W strike fill granodiorite showing a parallel distribution. Visible gold is frequently seen in the veins fractures.

6-2 Soil geochemical prospecting

6-2-1 Survey area and amounts

A total of 310 soil samples were taken from Andresito area, as shown in Fig.II-6-2 and Appendix 3.

6-2-2 Results of statistical data treatment

Statistical data treatment was performed for Andresito area. Between 31 elements (Ag, Sb, Bi, Be, Mo, Sn and W) indicated values of less than the detection limit for most of the samples (Appendix 4). Correlation coefficients were calculated in order to clarify the relation among elements, but no elements correlated with gold were found among the analyzed elements.

Based on the results of statistical data treatment, the threshold values were determined by cumulative frequency and EDA methods. The following is the threshold values for each element.

Au:12ppb	Ba:140ppm	Cu:17ppm	Pb:20ppm
Zn:68ppm	As:10ppm	Cd:1.2ppm	Sr:57ppm
Li:15ppm	Cr:60ppm	Co:14ppm	Ni:32ppm
V:58ppm			

Based on the threshold values of Au12ppb, were confirmed two gold anomalies in soil, named western anomaly and central anomaly. Interpretation map that overlap several anomalies are presented on Appendix 6.

Factor analysis was examined by multi element analysis. Relationships between elements and factors were extracted by the factor analysis and the result is shown on Appendix 7.

The relationships between elements are as follows:

Factor 1：Co-Ni

Factor 2：Cr-Co

Factor 3：Ba-Ni-Sr

Factor 7：Co-Cr-V

6-2-3 Results of soil geochemical prospecting

Soil gold anomalies were detected at western part and central part of the surveyed area, as shown in Fig.II-6-2. Gold anomaly of western part can be divided in two parts, one at north and the other one at south. The south anomaly was confirmed within granodiorite and the north anomaly is located at the boundary between gabbro and Arroyo Grande formation. In the north anomaly, the maximum gold value in soil was 60ppb and in the south anomaly was 33ppb. The gold anomaly in the central part is located within metabasalt and metatuff outcrops area. The maximum gold value was 40ppb.

6-3 Geophysical survey

Ground geophysical survey was carried out in Andresito East area and Andresito West area (Fig.II-6-3).

6-3-1 Andresito West area

This area is located to the NW side of the Andresito village. The paved road called Ruta General Jose Artigas crosses the NE corner of the survey area. 9 survey lines of ground magnetic and VLF-EM survey were set along the NS direction as indicated in The lines were prepared by using the same method as we used in Mahoma East survey area. A total of 8.35 km of lines for each survey method was surveyed.

(1) VLF-EM survey

Simultaneous to the ground magnetic survey, VLF survey was conducted on Andresito West area (Fig.II-6-4). VLF data were collected at the same profiles and stations as the magnetic data. The transmitter dipole of 1km length was located perpendicular to the profiles and about 1.0 km from the northeast side of the Andresito West survey area. Fig.II-4-19 shows the filtered map calculated by using the Fraser filtering method. The NE part of the area, along the Ruta General Jose Artigas could not be interpreted due to the effect of a high voltage transmission power line that crosses the area and that affected especially the data collected by the VLF-EM survey. The data collected around the SW corner of the area was also affected due to cultural noise coming from Andresito village. The

Karous-Hjelt (K-H) filter was also applied to the collected data and the results that are quite similar than the ones we obtained in the Fraser filtered data. The K-H results were also applied to the construction of the 2-D current density pseudo-section

(2) Magnetic Survey

The results of the magnetic survey are shown in Fig.II-6-5 indicating total magnetic field map (TMI). For, reduction to the Pole (RTP), we processed the ground magnetic grid to reduce it to the north magnetic pole.

A relatively strong magnetic trending is seen along NE direction, and it may be probably due to high magnetic volcano-sedimentary rocks. To the north of this trending, it was detected a magnetic contrast from intermediate to low magnetic contrast and inferred to be caused by shear fault zones. The low magnetic zone detected to the south of the above mentioned trending may be due to the response of gabbro/granodiorite structure.

6-3-2 Andresito East area

This area is located to the NE side of the Andresito village. The paved road called 'Ruta General Jose Artigas' crosses the NE corner of the survey area. Thirteen survey lines of ground magnetic and VLF survey were set along the NS direction. A high voltage power transmission line crosses the NE part of the survey area. The north part of the central survey lines crosses a community of houses where a small plant (El Dorado) is located.

(1) VLF-EM survey

The transmitter dipole of 1km length was placed about 1km from the northeast side of the survey area. Karous-Hjelt (K-H) filter was applied to the data and the results, presented in the Fig.II-6-6 were quite similar than the ones we obtained in the Fraser filtered data. The K-H results were also applied to the construction of the 2-D current density pseudo-section. A system of trends of weak positive-negative anomalies was detected along SE direction from the NW part of the area. As same as mentioned in the conclusion for the magnetic survey, a high voltage transmission line affected the VLF data collected in the eastern part of the survey area. According to the magnetic results, a fault system is seen distributed from the north east part of the area. They are also weakly detected by the VLF survey. A set of positive-negative VLF anomaly detected along the central lines needs further exploration work.

(2) Magnetic Survey

The results of the magnetic survey are shown in Fig.II-6-7 in the form of stacked profiles of the total magnetic field map (TMI). For reduction to the Pole (RTP), we processed the ground magnetic grid to reduce it to the north magnetic pole. According to the results of the RTP map, a high-low magnetic contrast SE trending was detected around the NW corner of the survey area. This trend runs all the way to the SE. Though there is no clear indication on the surface, this magnetic trend seems to be related to a fault system along SE direction. From the central profile along SE direction towards the remaining NE side of the area, no conclusion could be drawn because of a high voltage transmission line running along this direction that greatly affected the results.

6-4 Trench survey

6-4-1 Survey area and amount

Trench survey was carried out in two areas, named Andresito West area and Andresito East area. Trench survey was located where anomalies of soil geochemical prospecting overlapped VLF-EM anomalies. The location map of trenches is presented on Fig.II-6-8.

Trench number	**Direction**	**Length**	**Volume**
Trench 486900	N-S	300m	690.30m^3
Trench 487000	N-S	700m	1,512.6m^3
Trench 487100	N-S	600m	1,357.1m^3
Trench 487200	N-S	475m	1,018.4m^3
Trench 488500	N-S	200m	334.00m^3
Total		2245 m	4,912.30m^3

6-4-2 Geology

Results of trench survey are shown on Fig.II-6-9 and trench sketches are shown in Appendix 8.

(1) Soil

Trench survey clarified that the soil could be classified into the horizons A, B and C. Locally the C-horizon is not present while in other sites there are no distinction between B-horizons and C-horizons. The A-horizon, which is black clayey corresponds to the uppermost horizon locally presenting, mixed fragments of quartz veins and weathered rocks. The B-horizon is generally dark brown and it is a transition horizon to the C-horizon. The C-horizon characteristic depends of rock types, but it is in general yellowish and it is a transition horizon to the fresh rock or weathered rock, so locally it shows structures as quartz veins, dykes or shear zones, frequently related to gold mineralization.

(2) Host rock

The principal rocks present in the trench survey area are ancient granite (pCCG) at north and northeast, Arroyo Grande formation (pCCag) at central part and granodiorite (pCC) at its southwestern part. The Arroyo Grande formation is mainly represented by metabasalt intercalated in schist. Ancient granite (pCCG) was confirmed at the northern extension of the Arroyo Grande formation separated by a wide shear zone. Granodiorite is surrounded by gabbro and its contact with Arroyo Grande formation is by faults. Several aplitic dykes, granodiorite dykes and diabase dykes are present within Arroyo Grande formation. Quartz veins filling granodiorite show a NE-SW strike and dip to south.

(3)Geological structure

Aiming to understand the geological structure of the survey area, a stereo net interpretation was made and depending on the rose diagram of the survey area, it was understood that NW-SE structures is the most important, followed by NNE-SSW directions structures. Trench survey confirmed E-W strike schistosity and ENE-WSW shear zones and faults on geological boundaries, as shown in Fig.II-5-10. Granodiorite dyke and diabase dyke with ENE-WSW direction is intruded within Arroyo Grande formation. Quartz veins with visible gold fill granodiorite (pCC) with E-W to ENE-WSW strike and dip to north, as shown in Fig.II-6-1.

(4) Mineralization

1m wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows.

Trench 486900: 15m～16m(w:1m)0.95ppm and 94m～95m(w:1m)1.09ppm in quartz veins (Fig.II-6-11).

Trench 487000: 22m～26m(w:4m)0.29ppm, 68m～69m(w:1m)0.31ppm, 118m～119m(w:1m) 0.22ppm, 134m～135m(w:1m)2.06ppm, 136m～149m(w:13m)0.31ppm in quartz veins.

Trench 487100: 158m～159m (w:1m)0.08ppm, 196m～197m(w:1m)0.08ppm in quartz veins, 253m～254m（w:1m）0.16ppm, 277m～278m(w:1m)0.57ppm, 319m～320m(w:1m)0.09ppm, 424m～429m (w:5m)0.11ppm, 466m～467m(w:1m)0.12ppm in quartz veins lenses within diabase dyke.

Trench 487200: 44m～46m(w:2m)0.20ppm, 98m～99m(w:1m)0.35ppm, 124m～125m(w:1m)0.09ppm, 145m～148m(w:3m)0.19ppm in quartz veins and 369m～370m(w:1m) 0.11ppm, 388m～392m(w:4m)0.15ppm in quartz veins lenses within diabase dyke.

Trench 488500: 55m～56m(w:1m)0.39ppm in quartz veins. Gold mineralization in dolerite or border of dolerite is associated with gold rich quartz veinlets and quartz veins fragments filling dolerite dyke.

Gold mineralization detected in quartz veins of southern trenches is of higher gold grade, but it lacks in homogeneity of gold content, veins thickness and extension. Gold mineralization are probably related to the last stage of granodioritic intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets (Appendix 1).

The following elements; Co, Cr, Cu, Ni, V and Zn show anomalies halo in the border of the gabbro with Arroyo Grande formation.

Observation of Polished section (Appendix 1) in 16 samples of quartz veins detected gold in 10 samples. Milky quartz vein of the trench 487000 (142m) and trench 486900 (93m) presented pyrite and goethite as accessory minerals. Fluid inclusion samples (Appendix1) from these quartz veins showed a homogenization temperature of 257.1 degrees and salinity of 10.1%. X-ray samples (Appendix 1) indicated alteration minerals as silicification, kaolin and muscovite.

6-4-3 Interpretation results

Statistical data treatment was carried out on the samples taken in the trench survey area (Appendix 9). Between the 31 analyzed elements, (Ag, Sb, Be, Bi, Cd, Mo, Sc, Sn and W) indicated values of less than the detection limit for most of the samples. Correlation coefficients were calculated in order to clarify the relation among elements. As results, only As showed a low correlation of 0.254 with gold.

Based on the results of statistical data treatment, the threshold values were determined by cumulative frequency and EDA methods. The following is the threshold values for each element.

Au:75ppb	As:100ppm	Cu:57ppm	Pb:64ppm
Zn:160ppm	Ba:590ppm	Ca:1.5%	Sr:130ppm
Li:33ppm	Cr:57ppm	Co:44ppm	Ni:80ppm
V:110ppm	Mg:2.2%	Mn:0.1%	Ti:0.65%
Y:24ppm	Zr:62ppm		

All values above the threshold values of Au:75ppb were considered gold anomalies. So, it was confirmed gold anomalies related to quartz veins zones, with E-W trend, within granodiorite. Others gold anomalies were detected in the vicinities of the contact between gabbro and Arroyo Grande formation.

6-4-4 Compilation of trench survey results

The principal rocks present in the trench survey area are ancient granite (pCCG) at north and northeast, Arroyo Grande formation (pCCag) at central part and granodiorite (pCC) at its southewestern part. The Arroyo Grande formation is mainly represented by metabasalt intercalated in schist. Ancient granite (pCCG) was confirmed at the northern extension of the Arroyo Grande formation separated by a wide shear zone. Granodiorite is surrounded by gabbro and its contact with Arroyo Grande formation is by faults. Several aplitic dykes, granodiorite dykes and diabase dykes are present within Arroyo Grande formation. Geological structure of the survey area was interpreted by stereo net, and its rose diagram showed that NW-SE structures is the most important, followed by NNE-SSW directions structures. Trench survey confirmed E-W strike schistosity and ENE-WSW shear zones and faults. Quartz veins with visible gold fill granodiorite (pCC) with E-W to ENE-WSW strike and dip to north.

1m wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows.

Trench 486900: 15m～16m(w:1m)0.95ppm and 94m～95m(w:1m)1.09ppm in quartz veins.

Trench 487000: 22m～26m(w:4m)0.29ppm, 68m～69m(w:1m)0.31ppm, 118m～119m(w:1m) 0.22ppm, 134m～135m(w:1m)2.06ppm, 136m～149m(w:13m)0.31ppm in quartz veins.

Trench 487100: 158m～159m (w:1m)0.08ppm, 196m～197m(w:1m)0.08ppm in quartz veins, 253m～254m（w:1m）0.16ppm, 277m～278m(w:1m)0.57ppm, 319m～320m(w:1m)0.09ppm, 424m ～429m (w:5m)0.11ppm, 466m～467m(w:1m)0.12ppm in quartz veins lenses within diabase dyke.

Trench 487200: 44m～46m(w:2m)0.20ppm, 98m～99m(w:1m)0.35ppm, 124m～ 125m(w:1m)0.09ppm, 145m～148m(w:3m)0.19ppm in quartz veins and 369m～370m(w:1m) 0.11ppm, 388m～392m(w:4m)0.15ppm in quartz veins lenses within diabase dyke.

Trench 488500: 55m～56m(w:1m)0.39ppm in quartz veins. Gold mineralization in dolerite or border of dolerite is associated with gold rich quartz veinlets and quartz veins fragments filling dolerite dyke.

Gold mineralization are probably related to the last stage of granodioritic intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets. Observation of Polished section in 16 samples of quartz veins detected gold particles in 10 samples. Milky quartz vein of the trench 487000 (142m) and trench 486900 (93m) presented pyrite and goethite as accessory minerals.

Gold mineralization detected in quartz veins of the southern trenches shows slightly high gold grade, but it lacks in homogeneity of gold content, veins thickness and extension of mineralized section.

6-5 Consideration

Arroyo Grande greenstone rock (pCCag) was widely distributed in the survey area while granite (pCC) was observed at southern part and ancient granitic rock(pCCG) at northwestern part (Fig.II-6-11). Migmatite and strong metamorphism was observed within ancient granite and dolerite dyke was observed within granodiorite intrusion. Aplite, granodiorite and dolerite dykes were observed within greenstone rock. Granodiorite intrusion shows lower silica content at its northern border and at these places it presents a gabbro texture. Low dip quartz veins fill granodiorite with approximate E-W strike and show a parallel distribution. Visible gold is frequently seen in the veins fractures.

Gold soil anomalies were detected at western part and central part of the survey area. Gold anomaly of western part is divided in two, one at north and other at south. The south anomaly was confirmed within granodiorite and the north anomaly was located at the boundary between gabbro and Arroyo Grande formation. The maximum gold value in soil at north anomaly was 60ppb and at south anomaly was 33ppb. The central part gold anomaly was located within metabasalt and metatuff expositions and showed maximum gold value of 40ppb.

Simultaneous to the ground magnetic survey, VLF-EM survey was conducted on Andresito West and East areas. VLF data were collected at the same profiles and stations as the magnetic data. According to the magnetic results, a fault system is seen distributed from the north east part of the area. They are also weakly detected by the VLF survey. A relatively strong magnetic trend is seen along NE direction, and it may be probably due to high magnetic volcano-sedimentary rocks. To the north of this trending, it was detected a magnetic contrast from intermediate to low magnetic contrast and inferred to be caused by shear fault zones. The low magnetic zone detected to the south of the above mentioned trending might be due to the response of gabbro/granodiorite structure.

1m wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows: Trench 486900: Au (0.95ppm～1.09ppm), Trench 487000: Au (0.22ppm～2.06ppm), Trench 487100: Au (0.08ppm～0.57ppm), Trench 487200: Au (0.09ppm～0.35ppm), Trench 488500: Au(0.39ppm).

Gold mineralization are probably related to the last stage of granodioritic intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets. Gold mineralization detected in quartz veins of southern trenches is of higher gold grade, but it lacks in homogeneity of gold content, and also in veins thickness and extension. The above characteristic lowered the potentiality to find an economic gold deposit in the area.

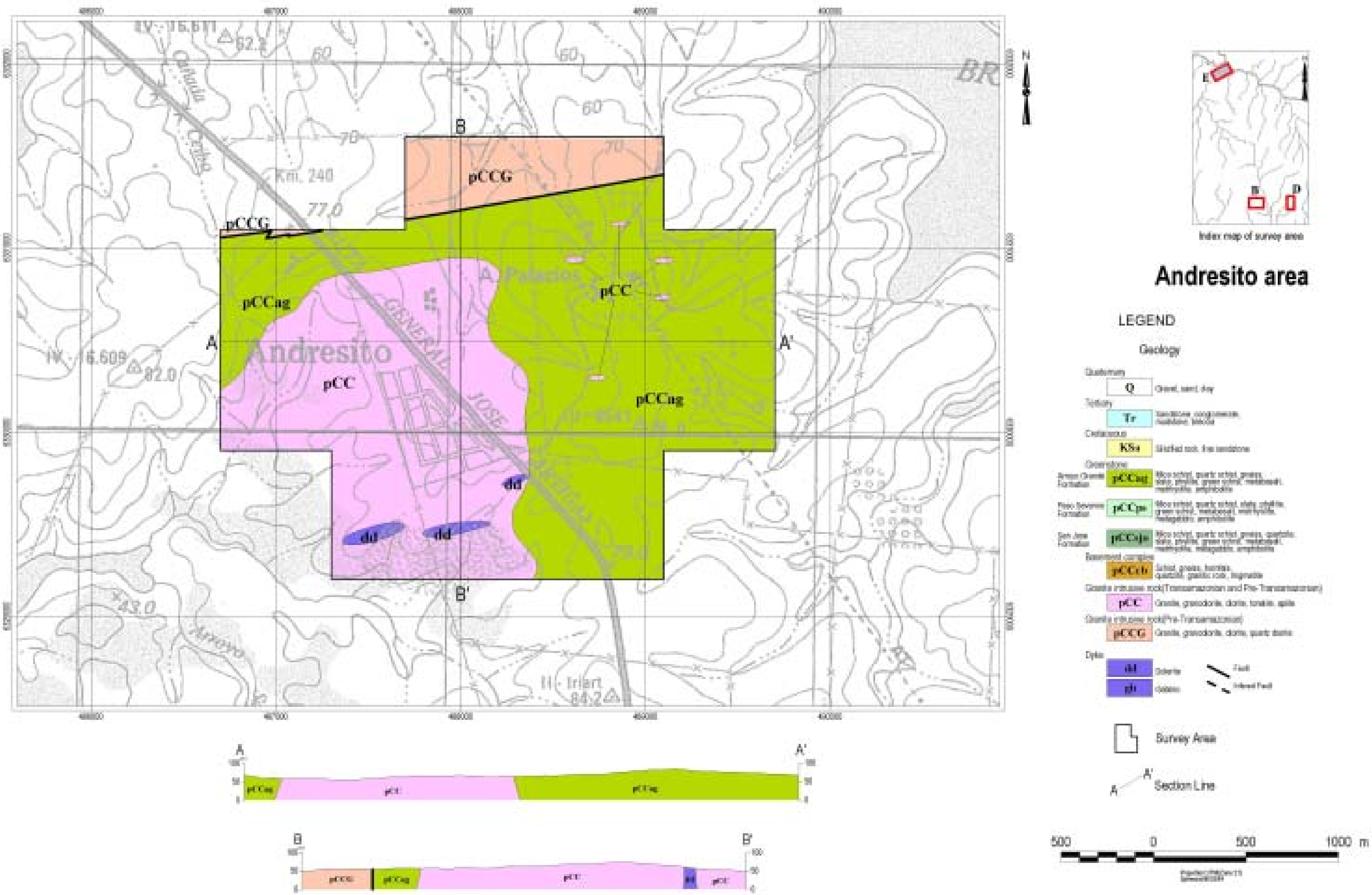


Fig.II-6-1　Geological map of Andresito area

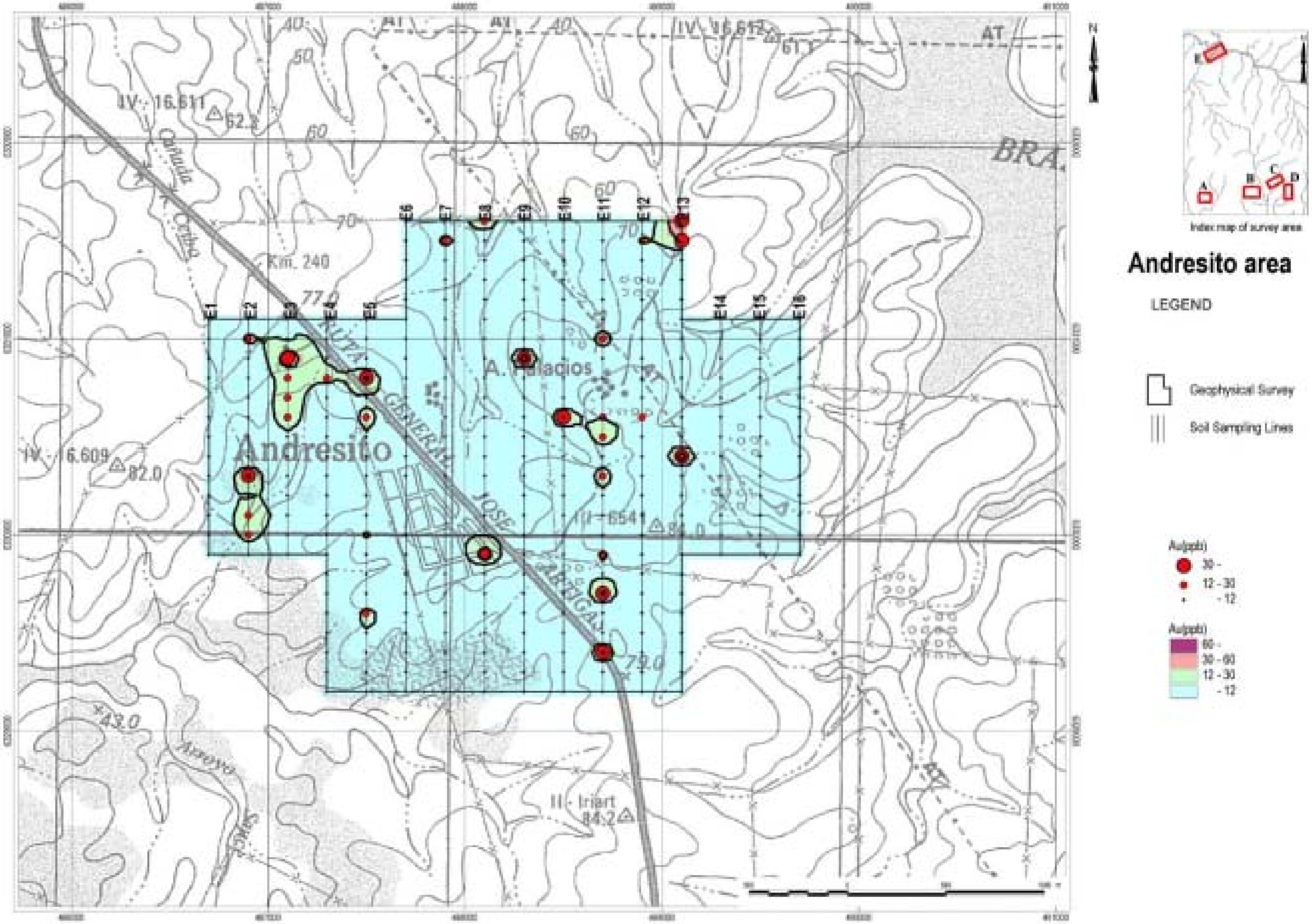


Fig.Ⅱ-6-2　Result of soil geochemical survey in Andresito area

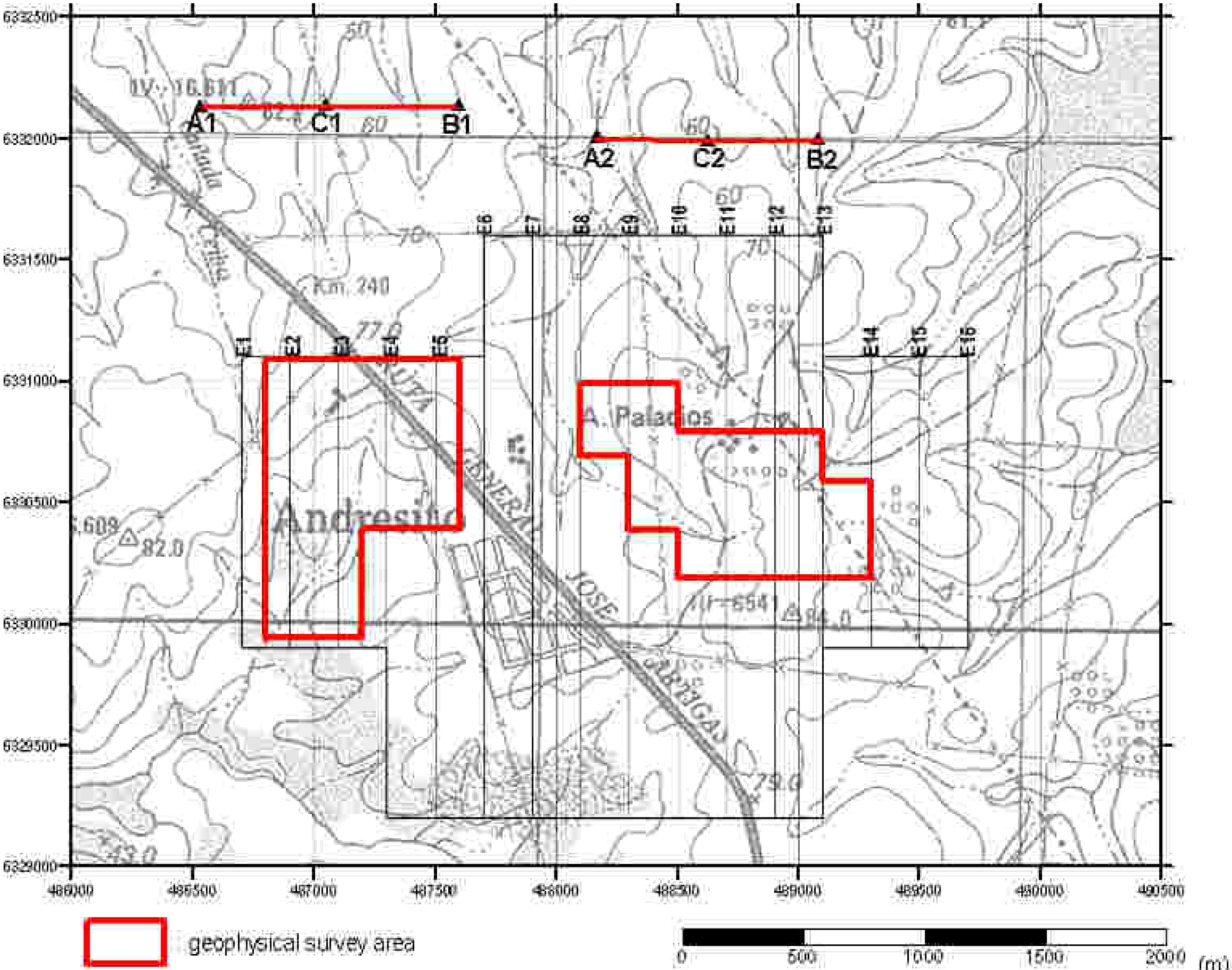
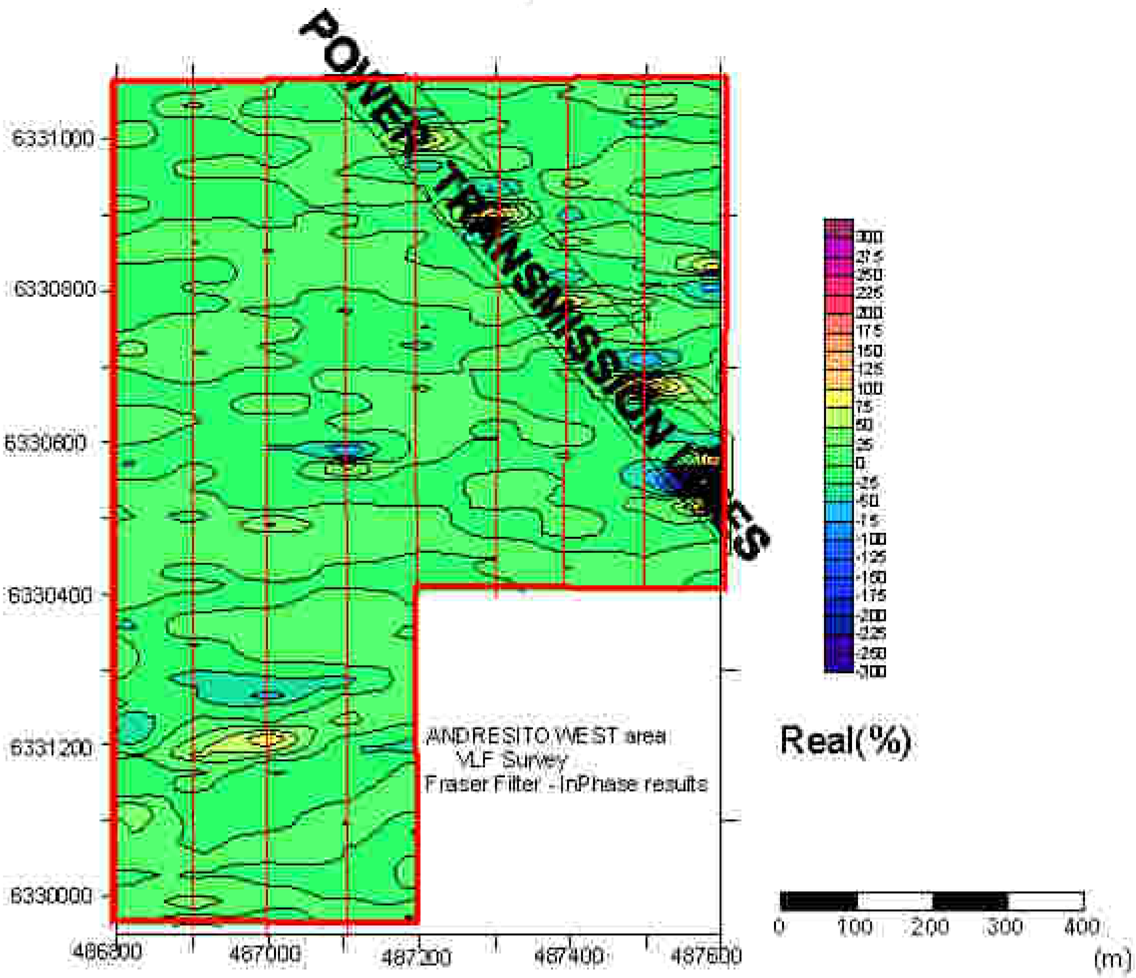


Fig.II-6-3 Geophysical survey areas and transmitter dipoles in Andresito area

Fraser filtered map



Equivalent current density pseudo-section along profile 487000

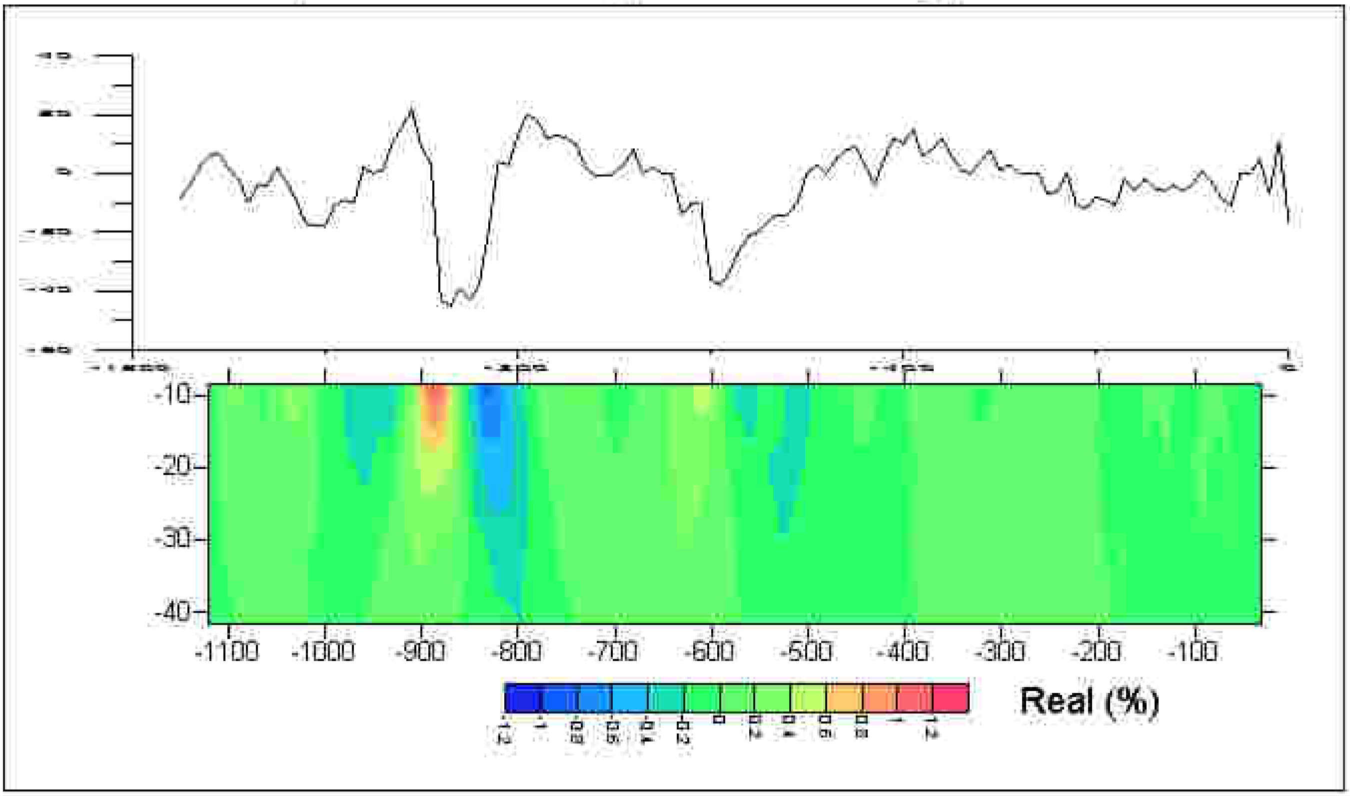


Fig II-6-4 VLF filtered results in Andresito West area

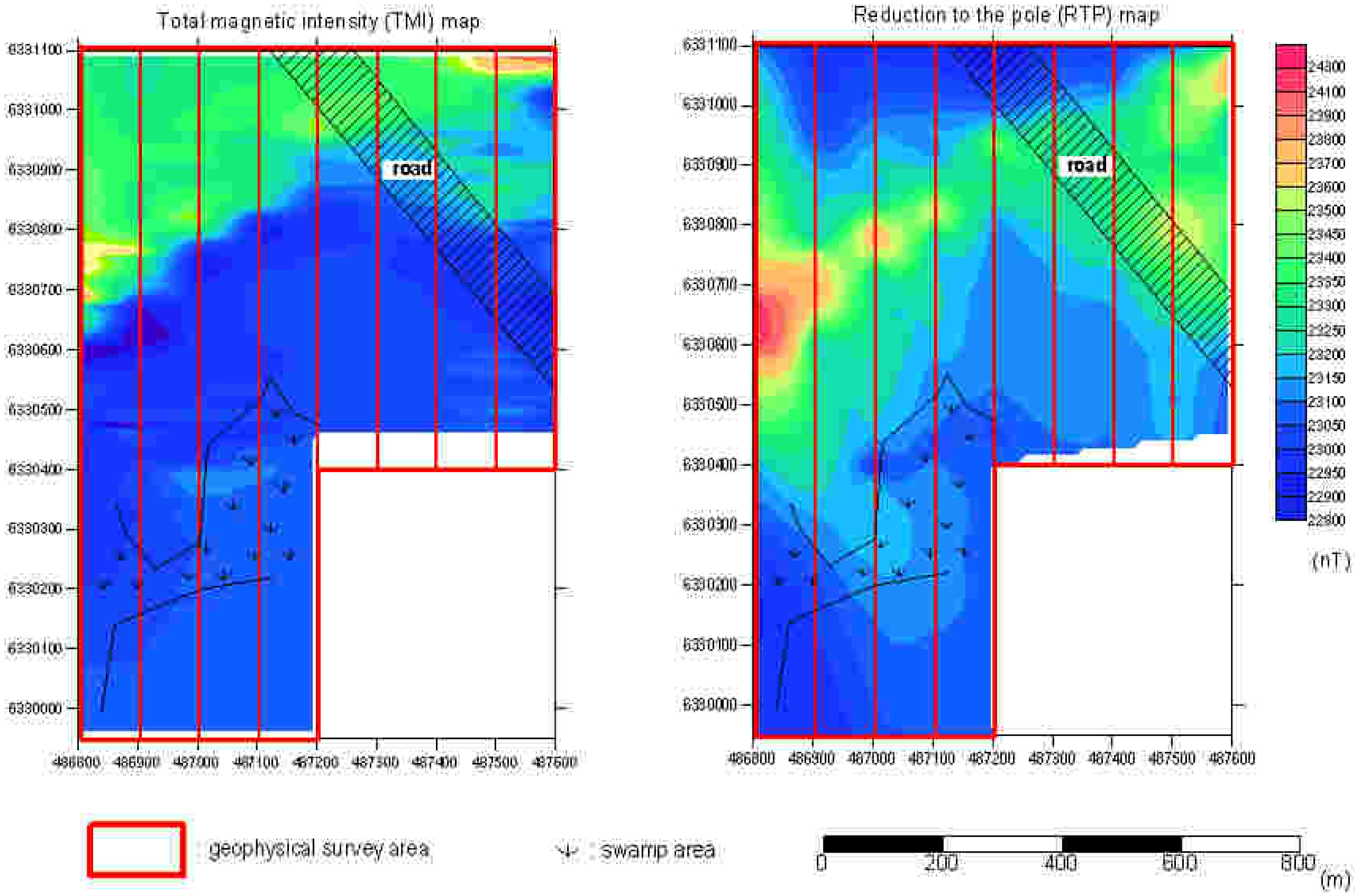
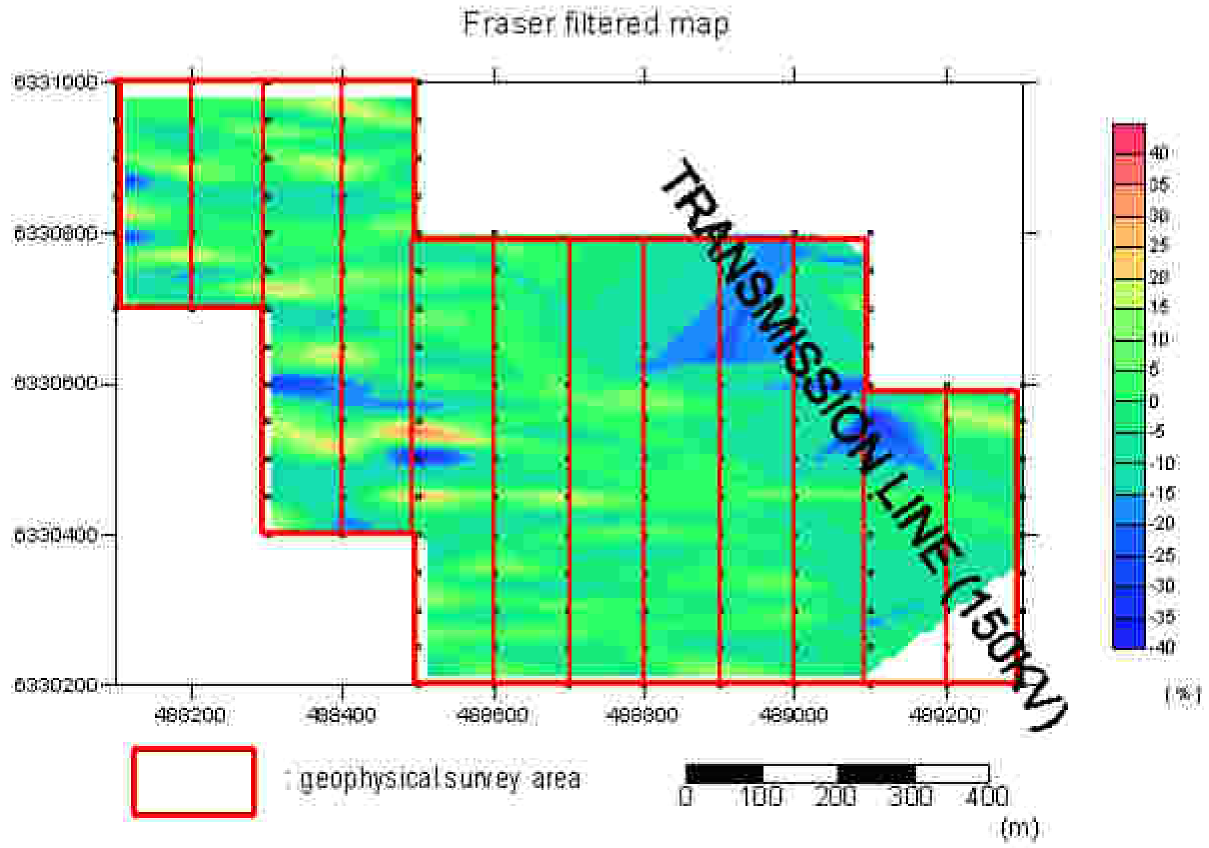


Fig II-6-5　Total magnetic intensity and Reduction to the pole in Andresito West area



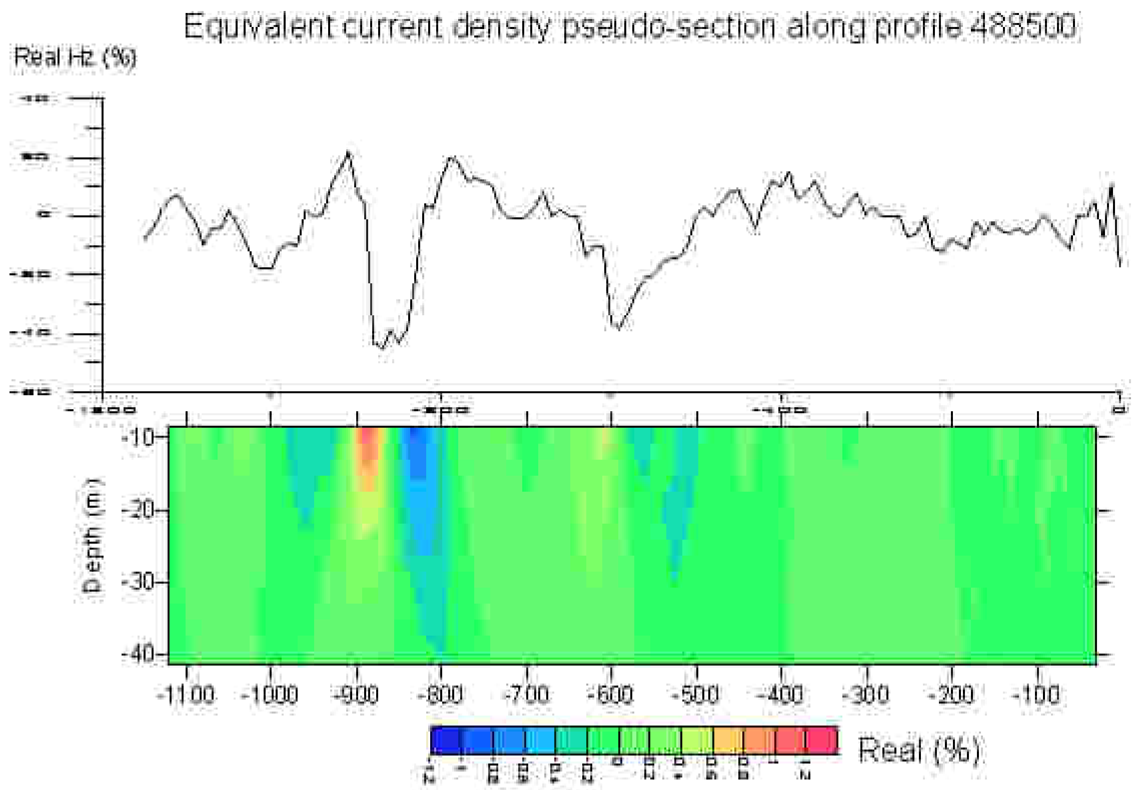


Fig II-6-6 VLF filtered results in Andresito East area

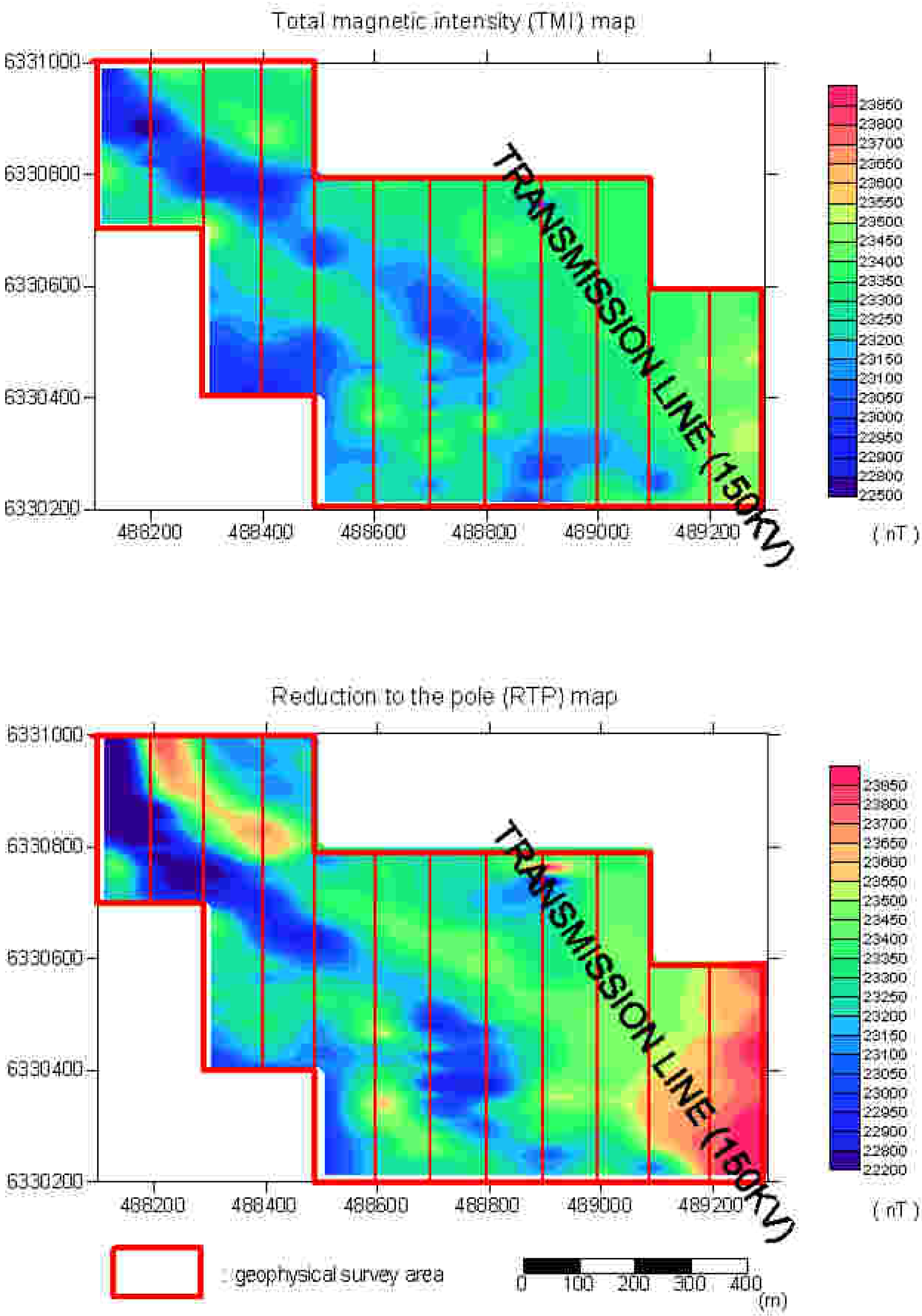


Fig II-6-7 Total magnetic intensity and Reduction to the pole in Andresito East area

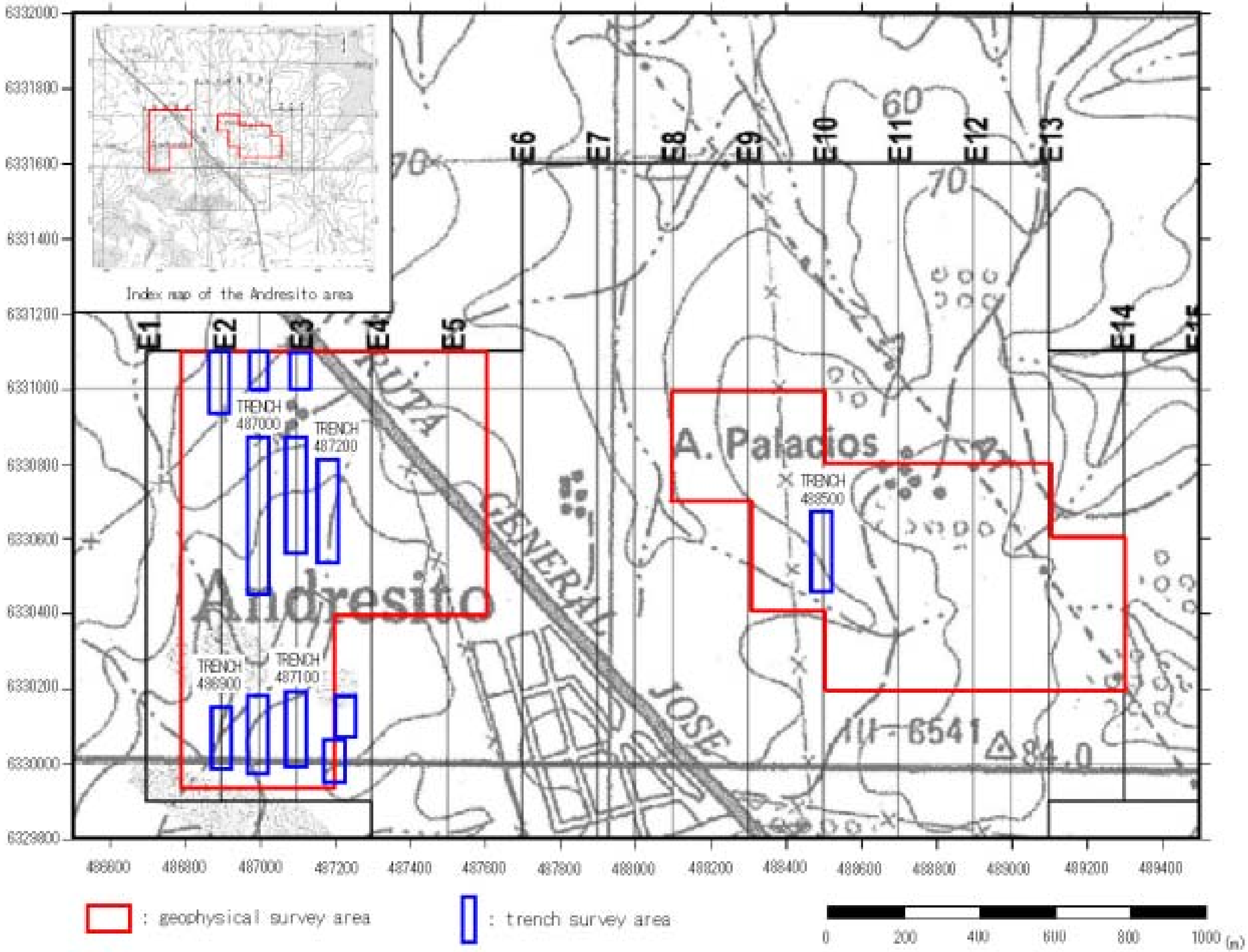


Fig.Ⅱ-6-8　Location map of trench in Andresito area

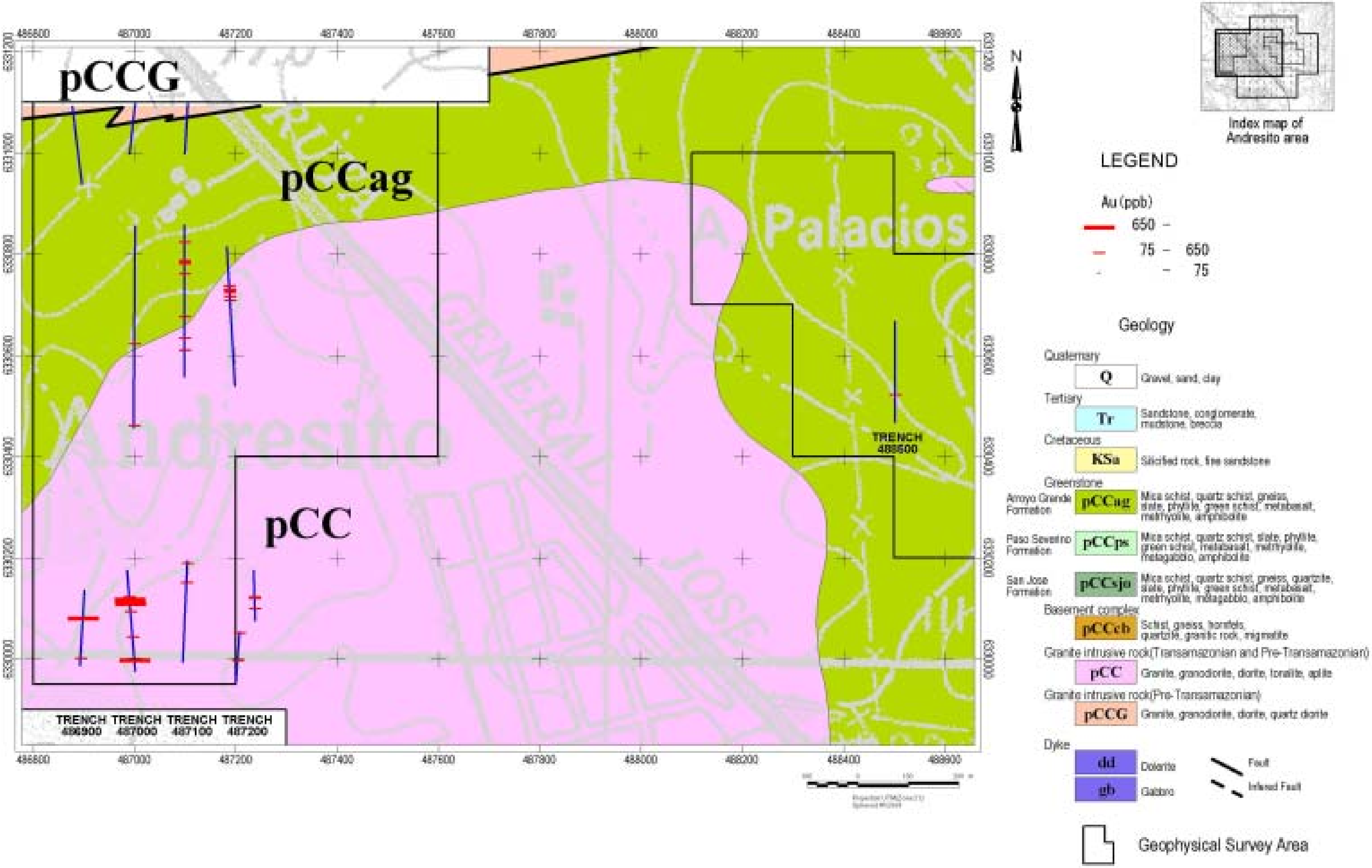


Fig.Ⅱ-6-9　Distribution map of Au anomalies from trench rock samples in Andresito area

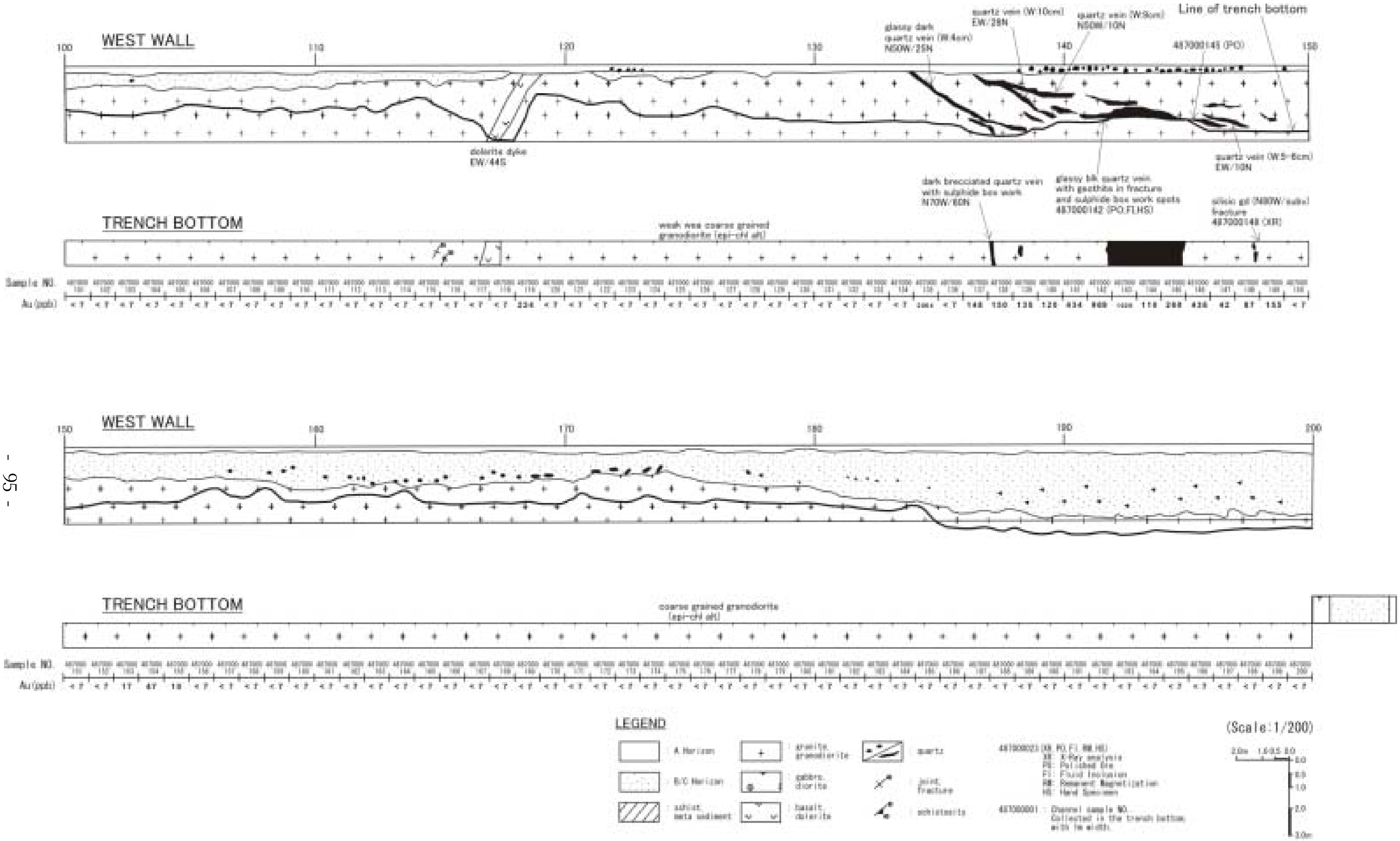


Fig. II-6-10 Sketch of trench 487000(100-200m) in Andresito West area

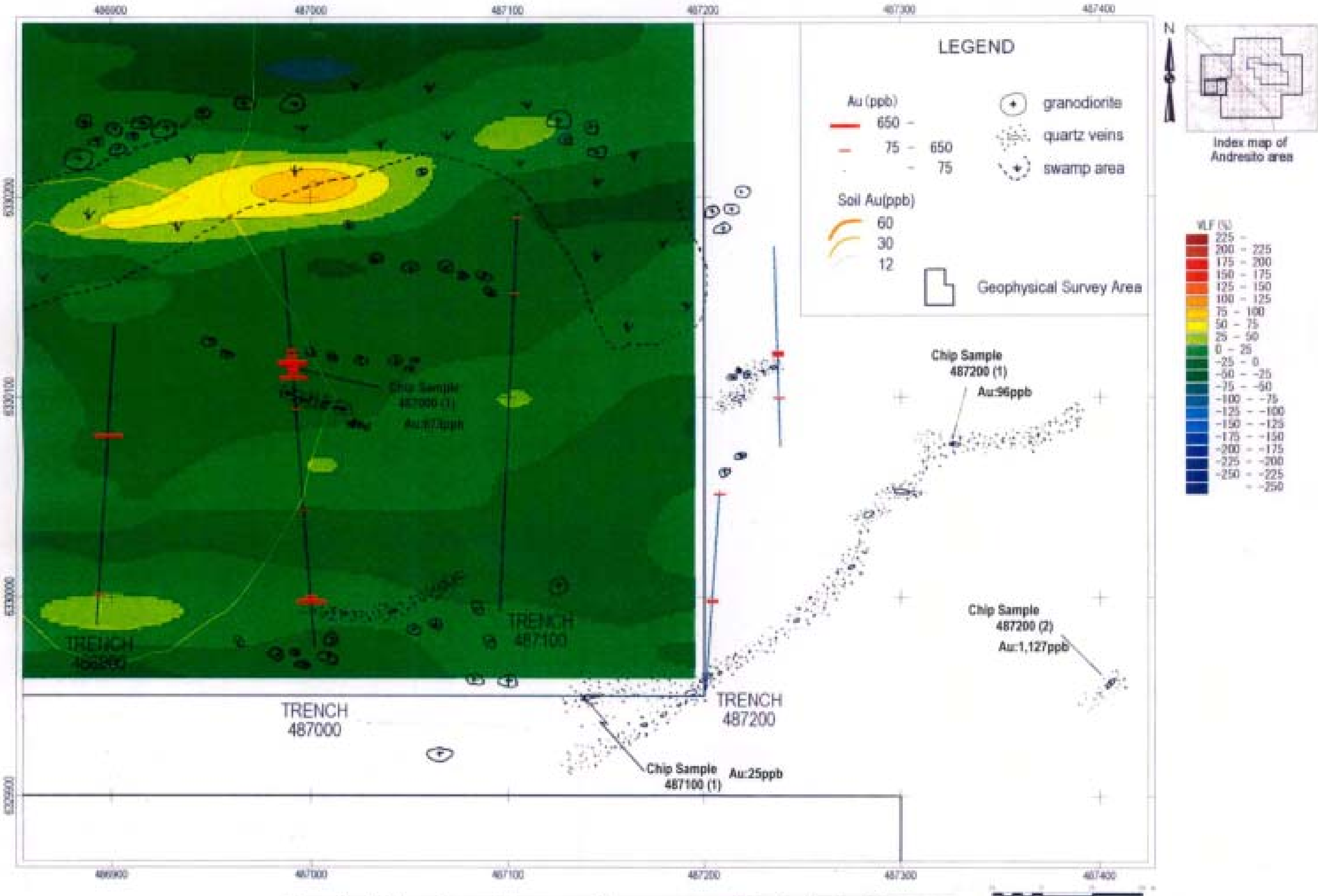


Fig. II-6-11 Composite map of survey results in Andresito area

CHAPTER 7 RESULTS OF MUNDO AZUL AREA SURVEY

As shown in the Fig.1, Mundo Azul area was divided in North area and South area.

7-1 Geological mapping

The geology of the Mundo Azul area consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granitic unit (pCCG) (Fig.II-7-1). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence that are widely distributed in the Mundo Azul area. Meta-volcanic rocks are present at the central part and meta-sedimentary rocks are present at the northern part and at the eastern edge of the areas. The meta-sediment shows black to dark gray phyllite and meta-sandstone that strikes to NW-SE and NE-SW. At the proximity of the ancient granite it is strongly silicified and show alteration minerals such as K-feldspar, epidote and chlorite. Outcrops of meta-volcanic are present at the central part of the Mundo Azul areas and it is composed of greenish color meta-basalt.

Both, Mundo Azul north and south areas show intrusion of ancient granite (pCCG), which is intruded by dolerite dykes (dd). Several faults and shear zones control the boundary between San Jose greenstone unit and ancient granite. Ancient granite is composed by several lithology as, medium to coarse texture biotite granite, muscovite granite, granodiorite, diorite and quartz diorite. Dolerite dykes outcrop along ENE-WSW direction, which is concordant with high magnetic anomalies detected during Phase II airborne survey.

7-2 Soil geochemical prospecting

7-2-1 Survey area and amounts

A total of 980 soil samples were taken from Mundo Azul areas, as shown in the Fig.II-5-2 and Appendix 3.

7-2-2 Results of statistical data treatment

Statistical data treatment was performed for Mundo Azul area. Between 31 elements (Ag, Sb, Bi, Be, Mo, Sn and W) indicated values of less than the detection limit for most of the samples (Appendix 4). Correlation coefficients were calculated in order to clarify the relation among elements. As results, there are no elements among the analyzed elements that correlate with gold.

Based on the results of statistical data treatment, the threshold values were determined by cumulative frequency and EDA methods (Appendix 5). The following is the threshold values for each elements.

Au:8ppb	As:13ppm	Cu:18ppm	Pb:20ppm
Zn:28ppm	Ba:80ppm	Cd:2.6ppm	Sr:20ppm
Li:8ppm	Cr:17ppm	Co:8ppm	Ni:12ppm
V:35ppm			

All values above the threshold values of Au: 8ppb were considered gold anomalies. As shown in the Appendix11, there are no concentration of soil anomalies in Mundo Azul north area, while the gold anomaly detected in the south area was very restricted and its maximum gold value was 20ppb.

Factor analysis was examined by multi element analysis. Relationships between elements and factors were extracted by the factor analysis.

The relationship between elements is as follows:

Factor 2：Cr-Ni

Factor 3：Cr-Fe-K-Sr

Factor 4：Mg-Li

Factor 5：Sr-Ni

7-2-3 Results of soil geochemical prospecting

Statistical data treatment performed for 980 soil samples (Fig.II-7-3) and (Fig.II-7-4) taken from Mundo Azul areas, showed that between 31 elements (Ag, Sb, Bi, Be, Mo, Sn and W) indicated values of less than the detection limit for most of the samples. Correlation coefficients were calculated in order to clarify the relation among elements, but there are no elements among the analyzed elements that correlate with gold.

A threshold value of Au was calculated to be 8ppb, and values above 8ppb were considered gold anomalies. There are no concentration of soil anomalies in Mundo Azul north area, while the gold anomaly detected in the south area was very restrict and its maximum gold value was 20ppb.

7-3 Considerations

The geology of the Mundo Azul area consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granitic unit (pCCG). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence that are widely distributed in the Mundo Azul area. Both, Mundo Azul north and south areas show intrusion of ancient granite (pCCG), which is intruded by dolerite dykes (dd). Several faults and shear zones control the boundary between San Jose greenstone unit and ancient granite. Ancient granite is composed by several lithology as, medium to coarse texture biotite granite, muscovite granite, granodiorite, diorite and quartz diorite. Dolerite dykes outcrop along ENE-WSW direction that is concordant with the high magnetic anomalies detected during Phase II airborne survey.

A total of 980 soil samples were taken from Mundo Azul areas and a statistical data treatment was performed. Between 31 elements (Ag, Sb, Bi, Be, Mo, Sn and W) indicated values of less than the detection limit for most of the samples. Correlation coefficients calculated to clarify the relation among elements showed no elements that correlate with gold among the analyzed elements. Threshold values of Au were calculated to be 8ppb, and values above 8ppb were considered gold anomalies. No concentration of soil anomalies was detected in Mundo Azul north area, while in the south area, the gold anomaly detected was very restricted and its maximum gold value was 20ppb.

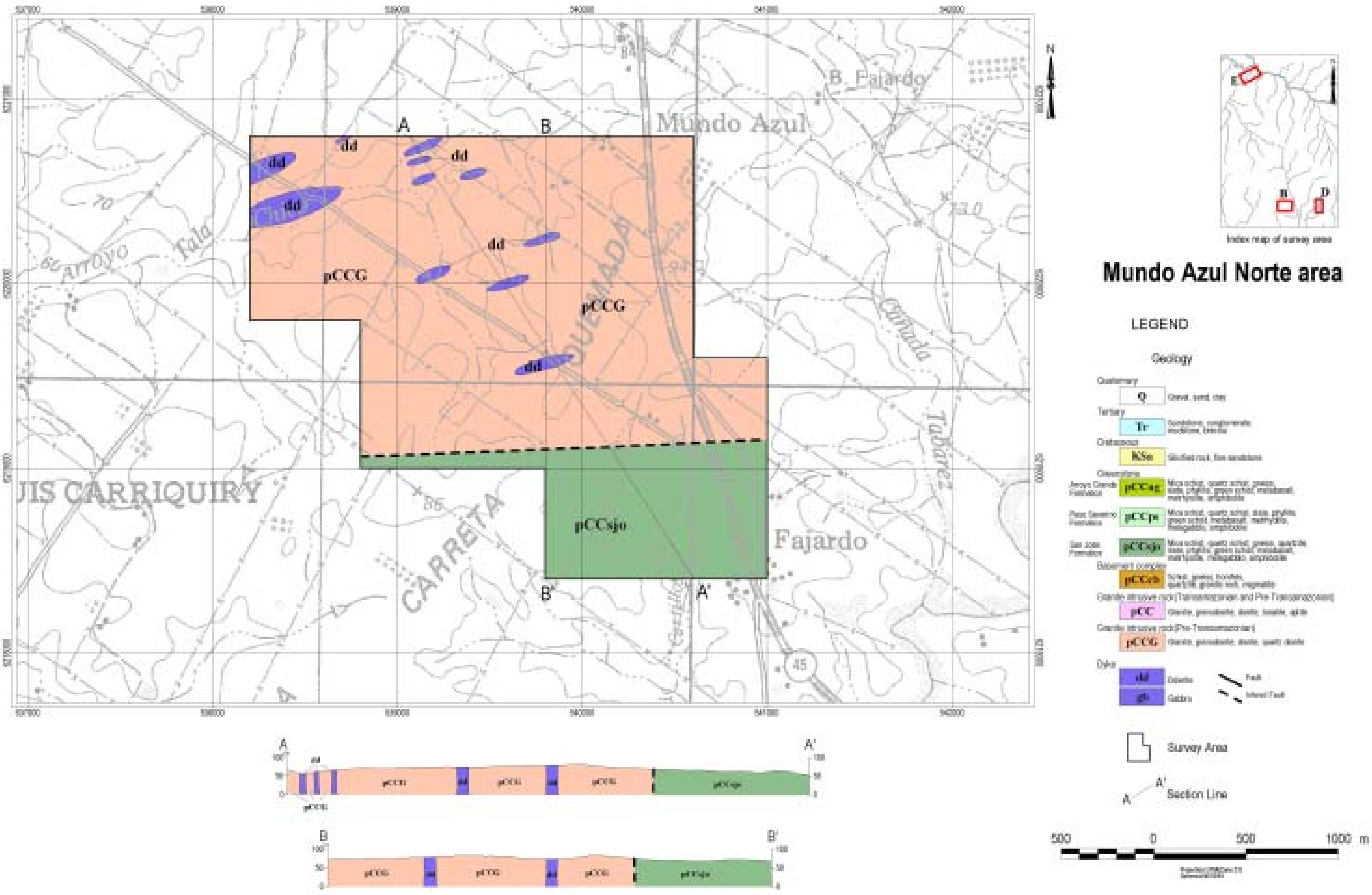


Fig.Ⅱ-7-1　Geological map of Mundo Azul Norte area

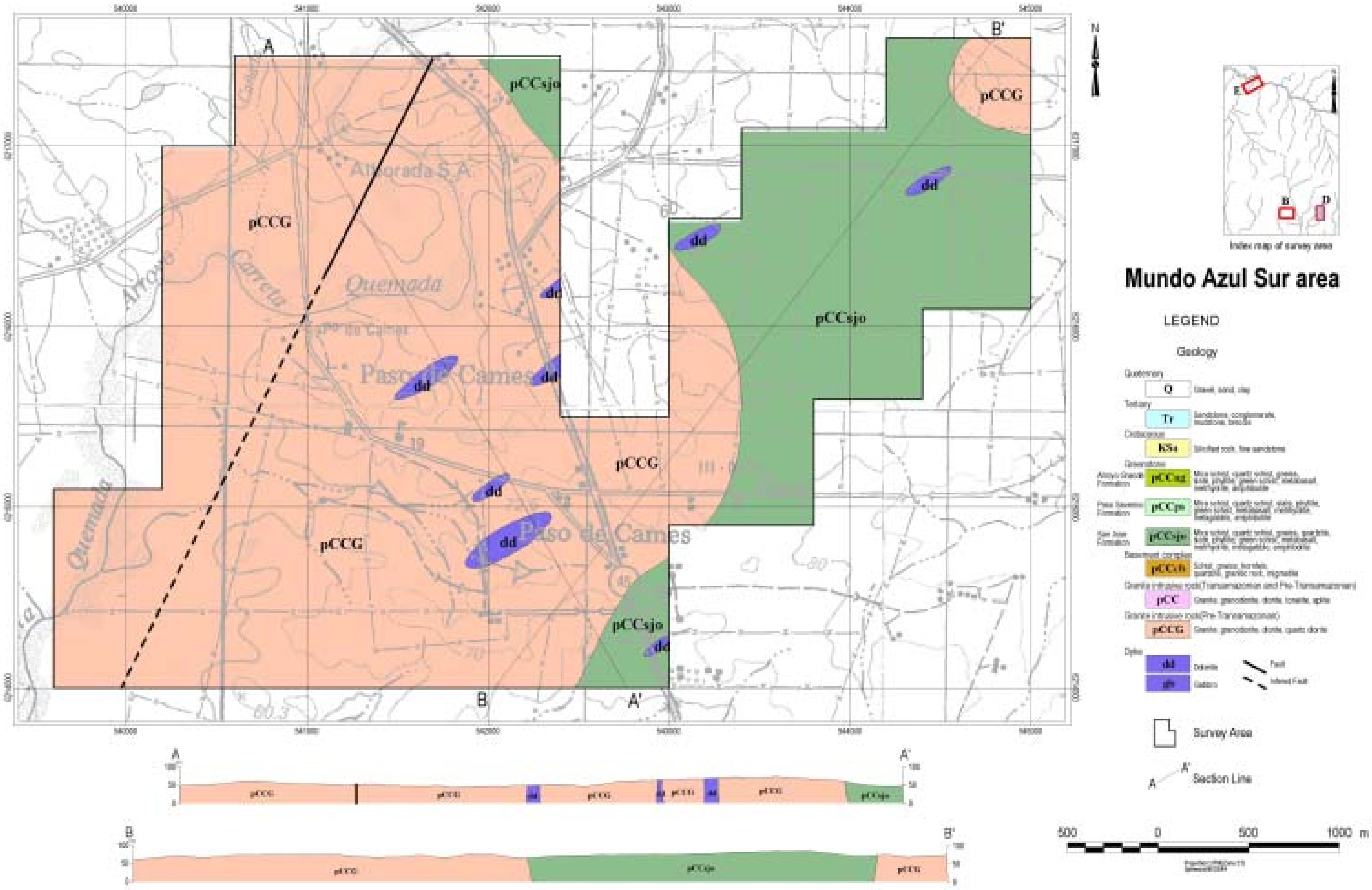


Fig.Ⅱ-7-2　Geological map of Mundo Azul Sur area

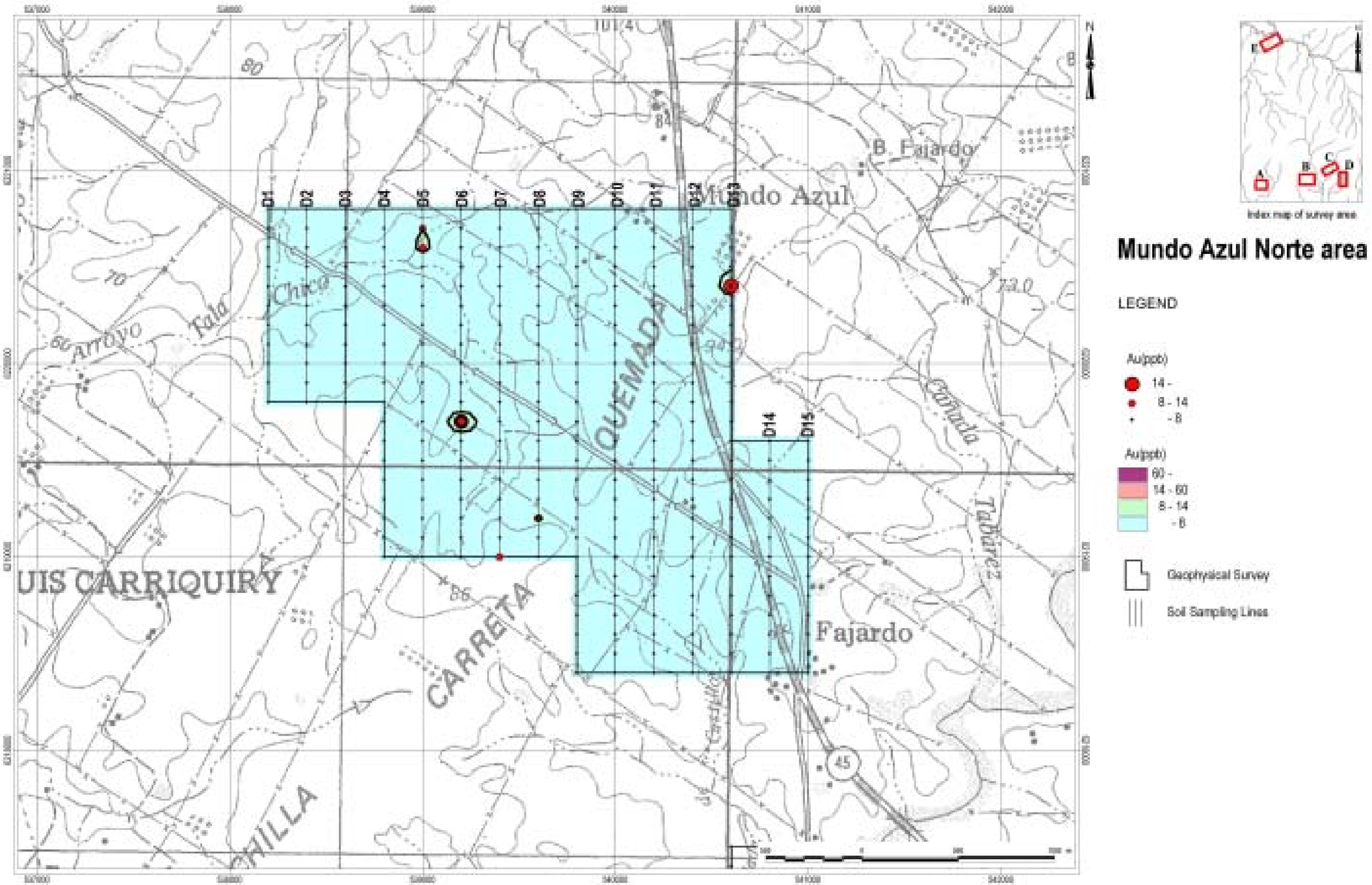


Fig.Ⅱ-7-3　Result of soil geochemical survey in Mundo Azul Norte area

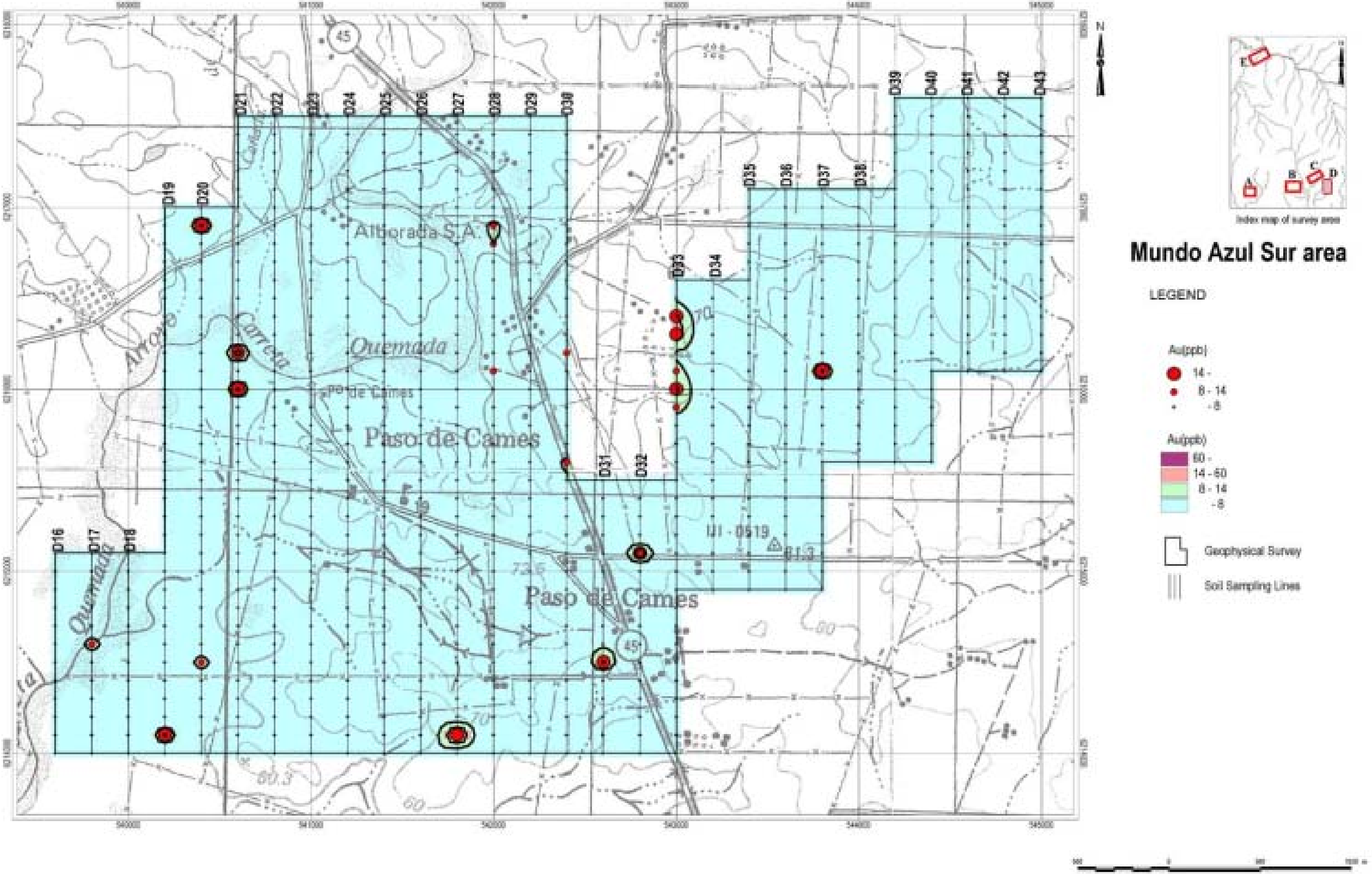


Fig.Ⅱ-7-4 Result of soil geochemical survey in Mundo Azul Sur area

PART III

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 1　CONCLUSIONS

Geological mapping, soil geochemical prospecting, geophysical survey and trench survey were carried out during Phase III survey in Mahoma East area, Andresito area and Arroyo Grande area (Fig.1 and Fig.2). The extracted conclusions are as follows:

(1) Mahoma East area

Statistical treatment of the collected 399 soil samples showed gold threshold value of 12ppb and maximum gold value of 96ppb in soil samples. Soil geochemical survey confirmed wide gold anomalies within granite rocks (pCC) that outcrop in the southern part of the survey area. Gold anomalies are present in the southeastern part of the granite at the proximity of the border with San Jose units. The detected gold anomalies approximately overlap the linear magnetic anomaly detected during airborne geophysical survey of Phase II. VLF-EM and magnetic geophysical prospecting carried out within soil geochemical anomalies confirmed linear magnetic and VLF anomalies overlapping the magnetic structure detected by airborne survey. Trench survey confirmed that the high magnetic anomalies and low VLF-EM anomalies were associated with diabase dyke. San Jose greenstone rock (pCCsjo) is distributed in the northeastern part and in the southern part of the survey area while granite (pCC) outcrops in the southwestern part and southern part of the same area. Aplitic dykes, pegmatite veins and dolerite dykes were observed within granite (pCC). Several shear zones with ENE-WSW direction were also identified by the trench survey. Diabase dykes with maximum width of 26m filled by quartz veins lenses and fragments were found within shear structures and 1m-wide channel sample confirmed maximum gold values of 745ppb. Other channel intervals confirmed the following results in diabase and granite filling quartz veins and quartz veinlets: trench 515600 with gold values between 0.13ppm and 0.75ppm, trench 515700 with gold between 0.13ppm and 0.27ppm, trench 515800 with gold between 0.25ppm and 0.54ppm, trench 515900 with gold between 0.14ppm and 0.31ppm.

(2) Andresito area

Chemical analysis of the collected 310 soil samples indicated threshold gold value of 12 ppb. Soil gold anomalies were detected at the western part and central part of the surveyed area. Gold anomaly of western part can be divided in two anomalies: one in the north and the other one in the south of the area. The south anomaly was confirmed in granodiorite, while the north anomaly was located in the border between gabbro and Arroyo Grande formation. Gold anomaly of the central part was present within outcrops of metabasalt and metatuff. Arroyo Grande greenstone rock (pCCag) that is widely distributed in the survey area is intruded by Granodiorite (pCC) at southern part and ancient granitic rock (pCCG) at northwestern part. Granodiorite intrusion shows lower silica content at its northern border and in these places it presents a gabbro texture. The maximum gold value in soil in the north anomaly was 60ppb and in the south was 33ppb. Low dip quartz veins fill granodiorite with approximate E-W strike and showing a parallel distribution. Visible gold is frequently seen in the veins fractures.

Simultaneous to the ground magnetic survey, VLF-EM survey was conducted in Andresito West and East areas. VLF data were collected at the same profiles and stations as the magnetic data. According to the magnetic results, a fault system is seen distributed from the north east part of the area. They are also weakly detected by the VLF survey. A relatively strong magnetic trend is seen along NE direction, and it might probably be due to high magnetic volcano-sedimentary rocks. To the north of this trending, it was detected a magnetic contrast from intermediate to low magnetic and inferred to be caused by shear fault zones. The low magnetic zone detected to the south of the above mentioned trending might be due to the response of gabbro/granodiorite structure.

1m-wide channel samples taken from trenches showed gold anomalies in quartz veins and in the borders of diabase dyke, as follows: Trench 486900: Au0.95ppm～Au1.09ppm, Trench 487000: Au0.22ppm～Au2.06ppm, Trench 487100: Au0.08ppm～Au0.57ppm, Trench 487200: Au0.09ppm～Au0.35ppm, Trench 488500: Au0.39ppm in quartz veins. Gold mineralization are probably associated to the last stage of granodiorite intrusion, with gold rich hydrothermal fluids filling shear structure in the form of quartz veins and quartz veinlets. Gold mineralization detected in quartz veins of southern trenches shows spots with high gold grade, but it lacks in homogeneity of gold content, in veins thickness and extension. The above characteristics are indicative of a low potentiality to find an economic gold deposit within Andresito area.

(3)Mundo Azul area

Statistical treatment carried out on a total of 980 soil samples taken from Mundo Azul areas, indicated that the correlation coefficients showed no correlation among the analyzed elements and gold. Though the threshold values of Au were calculated to be 8ppb, no concentration of soil anomalies was detected in Mundo Azul north area and very restricted gold anomalies with maximum gold value of 20ppb were detected in the south area.

The geology of the Mundo Azul area consists of San Jose belt (pCCsjo), Paso Severino belt (pCCps) and ancient granite unit (pCCG). The older units named San Jose and Paso Severino greenstone unit are composed by meta-volcanic and meta-sedimentary sequence widely distributed in the Mundo Azul area. Both, Mundo Azul north and south areas show intrusion of ancient granite (pCCG), which is intruded by dykes of diabase (dd). Several faults and shear zones control the boundary between San Jose greenstone unit and ancient granite. Diabase dykes outcrop along ENE-WSW direction that is concordant with the high magnetic anomalies detected during Phase II airborne survey.

CHAPTER 2　RECOMMENDATIONS

Recommendations for further surveys in Mahoma East area, Andresito area and Mundo Azul area are as follows:

(2) Mahoma East area

Trench survey detected wide shear zone intruded by diabase dykes with maximum width of 26m and lenses of quartz veins are filling these shear structures. Gold values between 0.13ppm and 0.75ppm in 1m-width channel were confirmed in granite and diabase. Gold mineralization detected in Mahoma East area presents low grade and it also lacks in homogeneity of gold content and extension. Due to this reason, no further exploration work can be recommended in this area.

(2) Andresito area

1m-wide channel samples taken from the southern trenches of Andresito area showed maximum gold values of 2.06ppm with gold values between 0.1 and 2.0 ppm in quartz veins. Since these results indicate a lack not only in homogeneity of gold content but also in veins thickness and extension, no further exploration survey can be recommended in this area.

(4) Mundo Azul area

Soil geochemical prospecting results indicated low threshold gold value of 8 ppb and only few soil gold anomalies detected with maximum of Au20ppb. Due to this reason, geophysical prospecting and trench surveys were not recommended during Phase II and no further survey is recommended for this area.

REFERENCES

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